the OIL AND GAS JOURNAL

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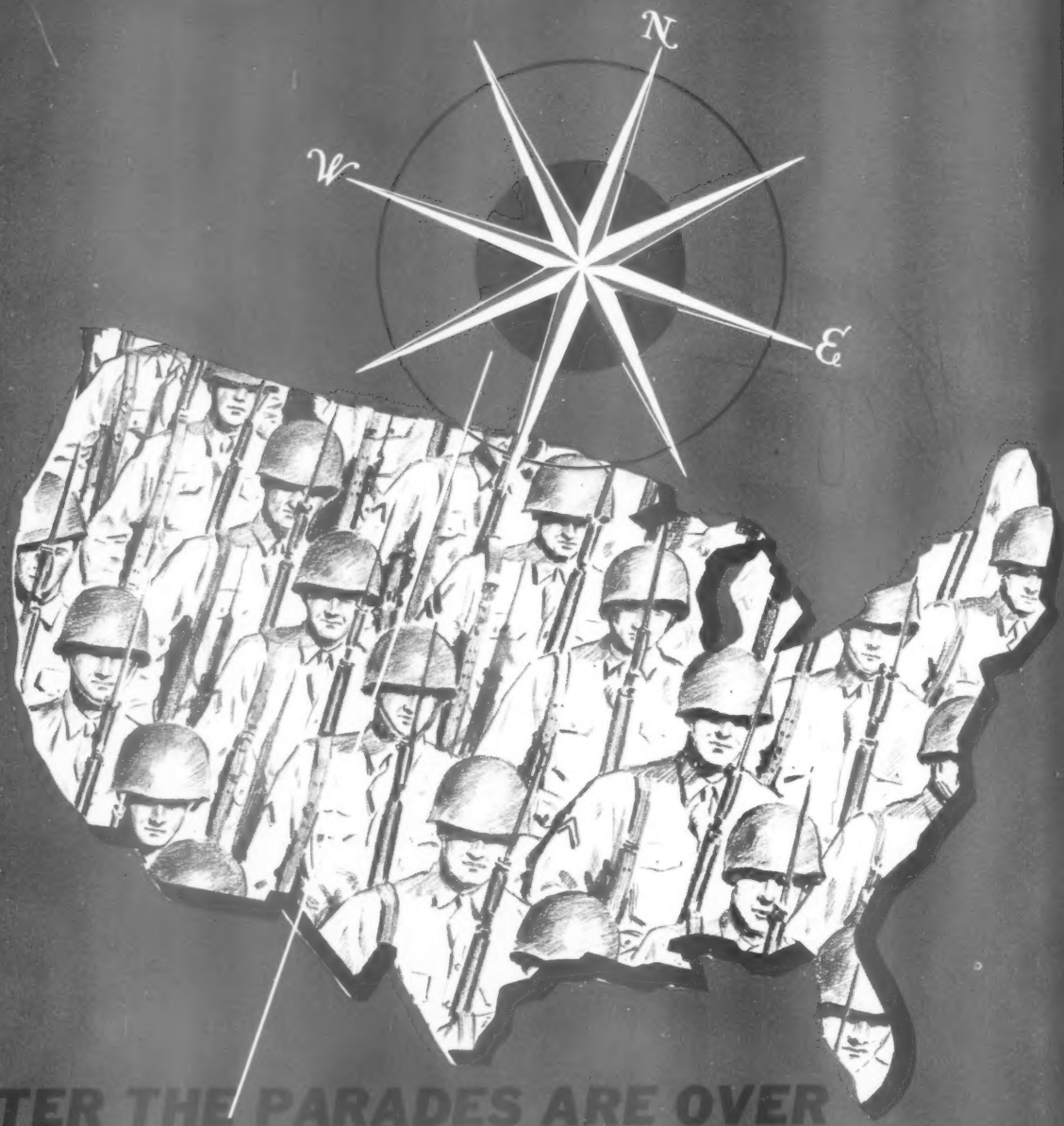

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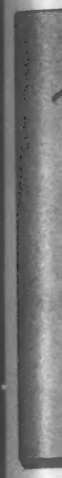

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WHEREVER the drums of war beat—in battle zones from tiny islands in the far Pacific to outposts that rim the arctic, must be transported drums of gasoline that are the very life-blood of Victory . . . to help supply this vital fuel, Hanlon-Buchanan is supplying Butanes and Stabilized Natural Gasoline—STA-VOL-ENE the "Natural" known throughout the World.

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Trends

Crude-Oil Production
By States—Page 126

CRUDE-OIL STOCKS 223,235,000 bbl. as of October 28—up 1,524,000 bbl. One year ago 237,219,000 bbl.

GASOLINE STOCKS 79,058,000 bbl. as of October 28—up 692,000 bbl. One year ago 69,092,000 bbl.

RESIDUAL FUEL-OIL STOCKS 64,224,000 bbl. as of October 28—up 280,000 bbl. One year ago 63,785,000 bbl.

GAS OIL AND DISTILLATE STOCKS 48,863,000 bbl. as of October 28—up 503,000 bbl. One year ago 44,713,000 bbl.

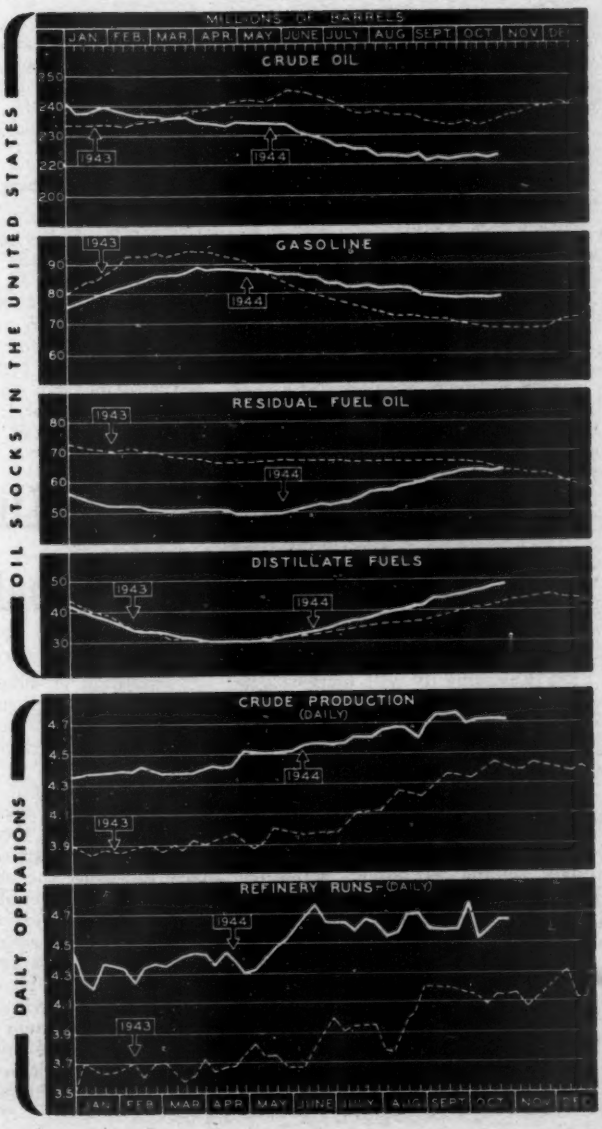
CRUDE-OIL PRODUCTION 4,719,350 bbl. as of November 4—down 18,450 bbl. One year ago 4,379,100.

REFINERY RUNS 4,658,000 bbl. daily week ended October 28—down 4,000 bbl. Year ago 4,184,000 bbl.

THE decision of the Minneapolis Association of Petroleum Retailers to become affiliated with the American Federation of Labor is being widely discussed within the refining and marketing branches of the petroleum industry. While the action affects directly only the retail distribution of products, the announced objectives of the unionized association, if realized and generally adopted, would react in all petroleum markets from the well through the processing operations. Furthermore, it is pointed out, the successful use of trade-union powers in retail operations might point the way to similar practices among operators in other branches of the industry.

THE vehicle to be used by the Minneapolis retailers is the strong teamster union, whose membership, as drivers of tank trucks, controls the delivery of products. Presumably it is the plan to enforce through the drivers any program adopted by the association. The association, announcing its plan, explained that the membership must maintain fair practices through membership vote, including margins, operating hours, lease protection, schedule of services, tire sales, and marketing differentials. The dues are $2.50 monthly with no inition fee to those who join within 30 days. Union benefits are included.

PROTECTION in the postwar adjustment period through standardization of station practices and prices is the obvious objective of the retailers. The plan reflects the fear which is said to be general among jobbers and retailers of petroleum products that after peace, for a time at least, there will be large surpluses of petroleum products which will bring back many of the unwanted competitive practices of the prewar period. Dealers say that their profits over the past 3 years have been satisfactory largely because of guaranteed margins and other protection afforded by government regulations applying to retail activities. They emphasize that retailers would be in conflict with state and federal statutes if they attempted to bring about this stabilization in operations through their own association. They would also have no direct means of enforcing their program. Whether legal responsibility is avoided when goals are attained under the cloak of trade unionism is one of the questions that will quickly be raised.



Soviet Effort Injects New Angle in Foreign-Oil Deal

by Henry D. Ralph

WASHINGTON. — A new and potentially serious international oil controversy apparently is developing in Iran as a result of the attempt of the Soviet Government to obtain a development concession in the northern part of that country.

According to dispatches from Moscow and London, the Soviets recently asked for a concession which was denied, and supplemental information indicates that both British and United States companies had also sought concessions in Iran but the Iranian Government decided to do nothing about granting any concessions until after the war.

United States officials are silent on the subject except that a State Department spokesman admitted that this government had made known its satisfaction with the Iranian decision not to grant any concessions at this time.

Apparently the refusal of the Russian request was based on the policy of postponing all consideration of concessions, though the Soviet press takes the position that the refusal was due to an anti-Soviet attitude on the part of the Iranian premier. Moscow dispatches suggest that as a result of this the Iranian cabinet may be forced to resign.

Display of Pressure Politics Seen

This situation is being interpreted by many observers as a display of pressure politics by the Soviet Government against foreign governments, possibly leading to serious difficulties for American oil companies now operating in the Near East. Certainly it will increase the difficulties of American companies seeking new concessions in any part of Iran.

This incident is the first indication that the Soviet Government is interested in developing foreign resources with Russian capital and technicians. In the past the Soviets have sought economic self-sufficiency and have neither exported nor imported capital.

Iran's decision to cancel all oil negotiations, it was said here, was taken reluctantly because she was about to grant a large concession to one of the companies which have been negotiating for her virgin oil fields for a year. Those companies were the Royal Dutch Shell, the Socony-Vacuum Oil Co., Inc., and Sinclair Oil Corp.

The American and British negotiations for the Iranian oil concessions began a year ago when Socony-Vacuum sent representatives to Iran. Sinclair and Royal Dutch Shell soon entered the field as well and it became a three way contest since the Iranian Government had indicated that the rights would go to but a single firm.

Early this fall it became apparent that Iran was ready to make a decision, probably in favor of one of the American companies, but the situation was suddenly complicated when Russia asked for concessions in the northeastern fields, which were not involved in the British-American concessions.

All Concessions Postponed

Iran decided to reject the Russian bid, but to make her position technically correct, she was forced to postpone all concessions. Edward R. Stettinius, Jr., acting secretary of state, declined to comment on the developments yesterday, but he said that the delay in arranging Russian-British-American talks on oil following the recent British-American oil conference had nothing to do with the Iranian oil incident.

Four reasons why the Iranian Government refused the Russian request for the immediate oil concession were given by Premier Mohammed Said in a broadcast from Teheran last week, the summary of which is now available. They were:

First, as long as foreign troops are in Iran public opinion would consider any concession as having been granted under duress. Second, the economic condition of the world was not clear. Third, the oil conference in Wahington left the situation in doubt. Fourth, all reports from Iranian representatives abroad urged that no concession should be granted until after the war.

Concurrence of the British Government in the decision reached by Iran to delay granting any new petroleum concessions was expressed in a statement carried by the British Broadcasting Co. and recorded in this country from the Office of War Information.

"The Persian Government decided on September 2," the BBC said, "to make no oil concessions to foreigners until after the war. A Soviet mission arrived in Teheran toward the end of September with the object of getting oil concessions in northern Persian before the end of the war. The Persian Government has refused to go back on their decision and the American Government has today stated through the Ambassador in Teheran that they accept what the Persian Government has done.

"Sir Reader Bullard, British minister, is in close contact with the Persian Government and he has no objection to their decision."

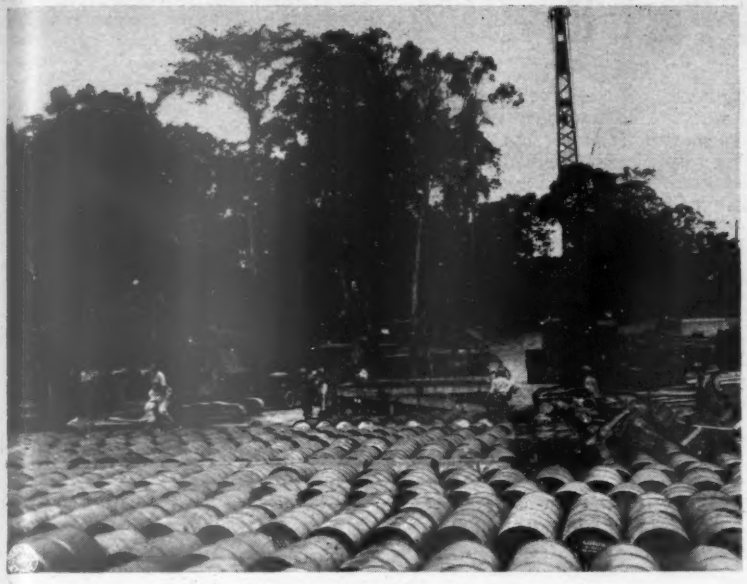
Pipe Lines Indispensable Link in Supplying Pacific Air Bases

WASHINGTON. — One day's consumption of 100-octane gasoline on an active fighting front in the Southwest Pacific area would more than supply the normal daily unrationed demands of a half dozen states, a statement issued by the War Department declares. When big air strikes are launched, enough gasoline is consumed at one major base to supply the unrationed needs of 1 million motorists for each day that the attacks are continued.

Delivery of gasoline to these air bases is a gigantic and never-ending task. Pipe lines have been laid in the Australian winter cold and in heat of regions near the Equator.

To get gasoline and oil ashore on D-day, as American troops assault an enemy-held island or beach, is a complex job. After the objective has been bombed and shelled to "soften up" the enemy, invasion troops start shoreward. One or more gasoline barges are in the first wave, their number dependent upon the size of the operation. Immediately upon establishing a beachhead, the barge, or barges, move ashore.

These gasoline barges are usually of 5,000-bbl. capacity and, in addition, they carry a 500-bbl. tank filled with the precious fuel. They are also equipped with 1,000 ft. each of 4-in. and 6-in. pipe. As soon as they are beached the 500-bbl. tanks are unloaded and moved to a small rise or dune on shore so that tank trucks may be filled by gravity flow. A pipe line is laid from its barge to the tank, and the latter is kept



Crane unloading gas drums from barges onto trucks at Sasavele harbor, New Georgia. Drums on other barges are awaiting unloading. (Signal Corps Photo)

supplied with gasoline pumped into it from the barge.

Under average conditions gasoline is ready for delivery by tank trucks to the captured or built-from-scratch air strips in half a day. The American method of filling tank trucks (2,000-gal. capacity) differs from that used by the Japs. The latters' tank trucks (800 to 1,000-gal. capacity) are filled by means of drums. This method requires 2 hours to fill one of our trucks. Using a pipe line and tank with gravity drop through a 4-in. hose, the time consumed is only 5 minutes.

Once the gasoline barges have performed their mission, that of initial supply of fuel and lubricants, and the area is firmly under the control of our troops, larger ships, bearing additional supplies and equipment, start arriving inshore.

Permanent pipe-line facilities then are set up. The usual procedure is to establish a booster pump for every 8 miles of pipe line. Soon from 200,000 to 250,000 gal. of 100-octane gasoline are being delivered to a single landing field daily.

While the Japanese control oil wells in Sumatra, Java and Borneo, there are three main reasons why this does not afford them any margin of superiority over American planes in the Southwest Pacific area. First, they do not have equipment to "crack" 100-octane gasoline. Second, the motors of their planes are not built to burn such high-octane fuel. Third, American troops get the gasoline and oil to the air fields faster and in greater quantity than do the Japanese.

Light Naphtha Placed Under Rationing Control

WASHINGTON. — Light naphtha will be placed under rationing control by the Office of Price Administration in 15 midwestern states on November 20.

Local ration boards will issue nonhighway gasoline coupons to naphtha users to cover their needs except that rations may be denied for uses for which it is not well adapted if substitutes are available. Light naphtha packaged in containers of less than 8 oz. will be exempt from rationing. Heavy naphthas are not covered by the order. The rationing was recommended by Petroleum Administration for War to stop illegal use as motor fuel in this area.

Navy Seeks Bids on Elk Hills Crude

WASHINGTON. — The Navy this week requested bids on approximately 6,800,000 bbl. of crude petroleum to be produced from the Elk Hills Naval Petroleum Reserve. The oil will be sold at a public sale to be held in San Francisco November 14.

This represents the amount of oil which it is estimated will be received by the Navy during the 6-month period ending June 30, 1945. Bidders will be expected to supply refined products for Army and Navy use in the Pacific theater, particularly, the Navy pointed out, aviation gasoline.

This is the second offering of Elk Hills oil produced jointly by Navy and the Standard Oil Co. of California under the unit-plan contract approved last June, and under the emergency program for production authorized by joint congressional resolution. Four California refineries are currently receiving crude for refining from the Elk Hills crude offered in August for the last half of this year.

WPB Consolidates Two Gas Divisions Under OWU

WASHINGTON.—The natural gas and manufactured gas divisions of the Office of War Utilities, War Production Board, have been consolidated into a single division, Edward Falck, director of OWU, announced last week.

Paul Taylor, New York, who has been director of the natural gas division, has resigned to return to private industry, Falck said. Alexander Macomber, Boston, director of the manufactured gas division, has been designated director of the new division. A. W. Lundstrum, of Maplewood, N. J., deputy director of the natural gas division, has been designated deputy director of the consolidated division.

Other executive personnel of the new division: C. L. Brockschmidt, Webster Groves, Mo., chief, natural gas supply and allocation section; Earl R. Hamilton, Needham, Mass., chief, manufactured gas supply section; Fred M. Kimball, Warrensburg, Mo., chief, manufactured gas allocation section, and Frederick B. Tracy, Galesburg, Ill., chief, materials distribution section.

FPC Probing Carbon Black Export, Inc.

WASHINGTON. — The Federal Trade Commission has begun an investigation of Carbon Black Export, Inc., to determine if the corporation has violated any provisions of the export trade act, more commonly known as the Webb-Pomerene law.

Carbon Black Export, Inc., is registered with FTC as a Webb-Pomerene association, which gives it certain exemptions from the antitrust laws in foreign trade but does not exempt it from prohibitions of restraint of trade and unfair trade practices with regard to domestic business.

The association is composed of the following companies: Columbian Carbon Co.; J. M. Huber Corp.; Panhandle Carbon Co., Inc., all of New York City; United Carbon Co., Inc., Charleston, W. Va.; Godfrey L. Cabot, Inc., Boston; and Charles Eneu Johnson & Co., Philadelphia.

Thompson Urges Pact Revision

LONGVIEW, Tex.—Col. Ernest O. Thompson, of the Texas Railroad Commission, speaking before five service clubs here last week, said the Anglo-American pact in its present form should be rejected and should be revised along the lines of the Interstate Oil Compact.

"When this treaty has been approved by two-thirds of the Senate it becomes the supreme law of the land," said Colonel Thompson. "The treaty as now written provides for allocation or fixing of production quotas in oil-producing areas of the world, including the United States.

"It includes the power to fix the price of oil and products at what may be deemed a fair price. It would make possible taking over the jurisdiction of conservation regulation by making determinations of sound engineering practices to be effectuated by federal law under this international agreement. It would permit the regulation of our domestic oil business in relation to economic advancement of foreign oil-consuming or foreign oil-producing countries. It would turn over to a commission acting under the treaty the control of import regulations and duties on foreign oil importations while the United Kingdom preserves 'imperial preference.' It would vest in an international oil commission powers of deciding peaceable countries as a basis for eligibility or banishment from international trade in oil.

"It would regulate production, processing, transportation and distribution of petroleum in the United States and would legalize cartels which are contrary to the genius of our Government.

"It is my suggestion that oil producers of Texas recommend that the Senate shall not consent to ratification of the Anglo-American petroleum agreement in its present form."

More Premium-Grade Fuel In Sight for Civilians

HOUSTON.—Civilians may get a little more premium-grade gasoline in December, according to a communication received here by J. S. Leach, chairman of the distribution and marketing committee for the Southwest, from Walter Hochuli, Washington, director of distribution and marketing for Petroleum Administration for War.

It had been hoped, said Hochuli, "that the tetraethyl lead situation would permit our increasing the volume of premium gasoline manufactured for civilian use during November. Refiners are limited to one-fourth of the premium motor fuel based on total gasoline. For the month of November, it is impossible to permit any relaxation. Some improvement in the stock-pile situation is indicated from this point on. There is a possibility that a slight increase may be permitted in December."

Kellogg Company Host To Trade Press Writers

NEW YORK.—The M. W. Kellogg Co., engineering and development firm, held open house to more than a score of trade press representatives November 2 at its New York offices and Jersey City laboratories. L. H. Harvison and Paul Ryan, vice presidents of the company, were hosts to the visiting writers and outlined in considerable detail the organization and operation of the company.

Among the interesting phases of the day's investigation was the trip through the research laboratories. The group was shown the pilot plants where much of the original research on fluid catalytic cracking was carried on, and where this study is still continued intensively. Other important work under way included propane fractionation of petroleum hydrocarbons for the elimination or isolation of various portions; study of improved fuels for internal-combustion engines and filtration studies of refining processes. Much of the establishment is now devoted to fabrication of war equipment covered by secrecy orders.

Control of oil resources and of crude output should be in the hands of state regulatory bodies and should be managed in anticipation of prevention of waste, Ryan stated in addressing the group. Any shortage of heavy residual fuel oil, could be made up by importation of heavy foreign crudes suitable for making this fuel, he said. Catalytic cracking, the refiners' newest conjuring stick, gives the refiner a new flexibility he has not had heretofore, in the making of products which make money rather than to make some of them which lose money, or are sold for prices less than the price of the same volume of crude. Transport costs of products must be reduced to 1½ to 2 cents per gallon for gasoline for example, Ryan believes, cutting down the margin of cost between refinery and consumer, in the postwar period.

NEXT WEEK . . .

The JOURNAL'S Postwar Study

Analytical data from the industry's top technical men, economists and bureaus have been consolidated by the Journal's editors and reduced largely to charts, graphs and pictograms for guidance of operations over the next 6 years. A complete 32-page section will be devoted to this presentation in next week's Journal, making it the most complete analysis of postwar probabilities compiled within the petroleum industry.

Texas Co. Adopts Surgical, Hospital Benefit Plan

A hospital and surgical benefits plan for employes of The Texas Co. and domestic subsidiaries is now in effect throughout the United States, it was announced here today by Harry T. Klein, president of the company. Already nearly 19,000 eligible employes, or approximately 93 per cent, throughout the country have become members of the plan, which went into effect November 1. Benefits include payment at the rate of $4 per day for each day the employe is confined in a hospital.

The plan, a voluntary one, provides benefits for hospital confinement and surgical operations not otherwise covered by workmen's compensation or similar provisions. The plan costs the individual employe 50 cents a month. The company pays the balance.

THIS WEEK

INTERNATIONAL—Squabble over Iranian oil concessions growing more ominous. . . . American State Department, British Foreign Office side with Iran, against Russia. . . . Soviet press highly critical of Iran's decision to postpone all concession negotiations. . . . ¶Bomb damage to Romanian oil fields, before Nazi retreat, exceeded earlier estimates. . . . Joint Allied commission finally admitted by Soviet military to appraise damage, start rehabilitation. . . . ¶Numerous new companies become active in acquiring Venezuelan concessions. . . .

PRODUCTION—Reduction in West Edmond allowable recommended by large operator, to arrest water intrusion. . . . ¶Discovery in Wyoming flows 60 bbl. an hour from Dakota pay. . . . Crude tests nearly 38 gravity, helping sweet-oil supply outlook. . . . ¶California yield off 8,000 bbl. per day, Kansas down 26,700; Oklahoma increase of 12,650 cushions national decline. . . .

DRILLING—Current completions averaging more than 500 weekly, including service wells. . . . Total for 10 months is 21 per cent above 1943 rate, a rise of 3 per cent since midyear. . . . ¶All available rigs operating but more are needed to achieve 1945 requirements. . . .

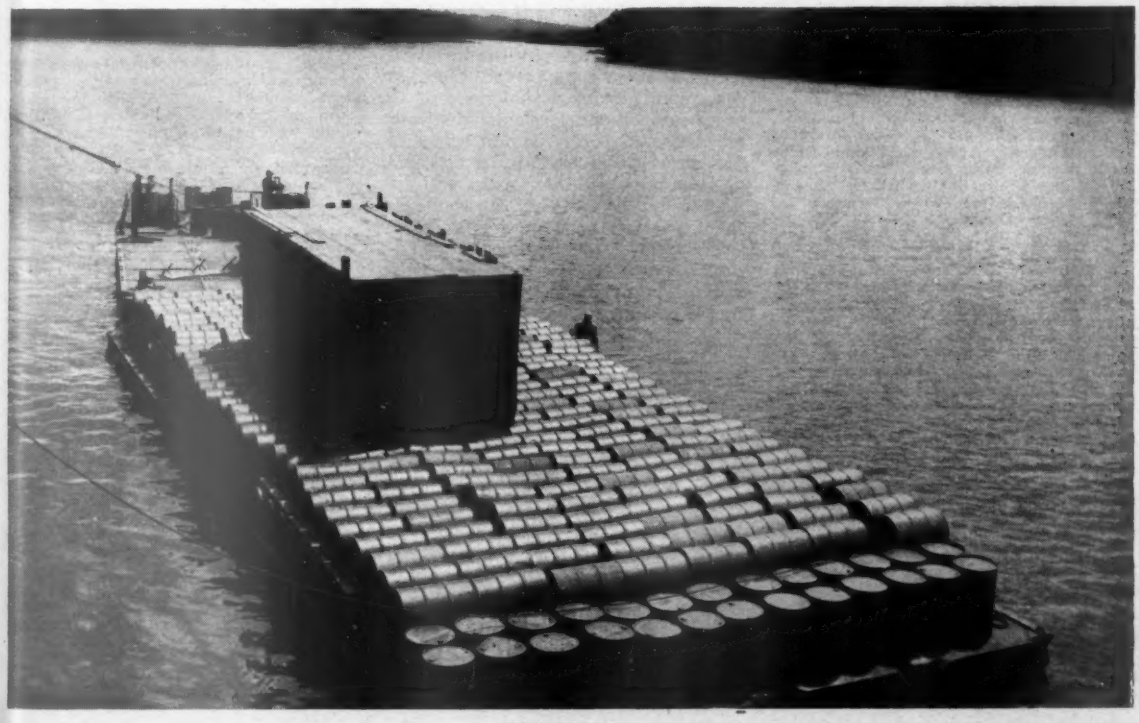
SUPPLIES—Hesitancy of consumers to order out fuel oil causing critical stock accumulation at some refining centers. . . . ¶Increase possible in premium motor fuel for civilians next month, although total probably will be changed. . . . ¶Critical situation arising in sweet crude available for WEP transmission. . . .

REFINING—Two major refinery projects, predicated on war usefulness, reported authorized by Petroleum Administration for War. . . . ¶Strike vote called for November 16 at Humble Oil & Refining Co.'s Inglewood, Tex., plant. . . . Dispute arose over company's failure to include maintenance-of-membership clause in union contract. . . . ¶Liberalized severance-pay plan, proposed by Sinclair Refining Co., wins NWLB approval. . . .

TRANSPORTATION—Another large diameter gas line proposed from Hugoton to Detroit district. . . . ¶Formal plans for Hugoton-California line disclosed by application pending with Securities Exchange Commission. . . . ¶Tennessee Gas & Transmission Co.'s 1,256-mile line starts eastern gas deliveries with minimum of difficulty. . . . ¶Tank-car deliveries of crude and products to East Coast approximately static at 513,725 bbl. per day, off nearly 50 per cent from emergency peak. . . .

PRICES—Ceiling prices raised in 33 Louisiana and Texas fields, lifting postings to parity with comparable crude and condensate. . . . ¶Detailed instructions issued on how to qualify high-cost fields for subsidy payments. . . . Necessary data will promote standardization in bookkeeping at the very least. . . . ¶OPA issues complete, revised list of subsidy fields, giving complete picture by pools, counties, states, and amounts of subsidy. . . .

Barge leaving side of ship anchored in harbor at Sasavele Island, New Georgia, after taking on a load of gasoline drums. Delivery of aviation fuel to Pacific air bases is a never-ending task, and barges, pipe lines and tank trucks combine in the herculean effort to keep the fighting planes in the air. (Signal Corps Photo)



Ceilings Advanced in 33 Pools; Purchasers Will Absorb Increases

WASHINGTON. — Upward adjustments in the ceiling prices of crude oil produced by 33 pools in Louisiana, Kansas, Oklahoma, and Texas were announced by the Office of Price Administration November 6.

The adjustments, which become effective as of November 9, 1944, were made pursuant to the policy of OPA to make local adjustments when it is clearly demonstrated that the maximum price is out of line with the maximum prices of comparable crude in the same area. The increases will be absorbed by purchasers of the oil, and hence no increase in the prices of petroleum products made from the oil will occur, OPA said.

The adjustments are in five groups, as follows:

1. Lisbon field, Louisiana, is allowed a ceiling price of $1.40 per barrel for all gravities of crude produced. This is an increase of 20 cents a barrel.

2. Joe's Lake and Silsbee fields, Texas, are allowed a ceiling price of $1.36 per barrel for 34° gravity crude, with 2 cents deducted for each gravity point under 34. The new ceiling represents an increase of 11 cents a barrel.

3. Abell and Barnhart (Ordovician) fields, West Texas, are granted a ceiling price of $1.25 for 40° gravity, per barrel, with the usual 2 cents deducted for each lower gravity degree, down to 93 cents for below 25°. This is an increase of 13 cents a barrel.

4. For 21 fields in southern Louisiana, uniform ceilings are established at $1.30 per barrel for 40° gravity oil and over, with the customary differentials for crude oil of lower gravities. Four of the fields previously had a flat schedule of $1.19 per barrel for all gravities; four other fields had ceilings from $1.05 for below 31° gravity to $1.25 for 40° gravity. The other 13 fields had ceilings ranging from $1.06 to $1.22 per barrel. The 21 fields affected are Avery Island, Barataria, Bateman Lake crude oil, Bateman Lake cycle condensate, Bay de Chene, Delacroix Island, Delta Duck, Delta Farms, Dog Lake, Erath, Fausse Point, Golden Meadow, Horseshoe Bayou, Jefferson Island, Lake Salvador, Lafitte, Paradis, Plumb Bob, Stella, Vermillion Bay, West Cote Blanche Bay.

5. Two pools in Kansas and five pools in Oklahoma are excepted from the general spellout of crude-oil ceilings for these two states which became effective October 3, 1944. They are now put on the same basis as the Morel pool in Kansas, with ceilings from $1.01 per barrel for crude below 29° gravity to $1.25 per barrel for crude of 40° gravity and over. Heretofore they had ceilings from 85 cents for gravities below 20° to $1.25 for 40° gravity crude and over. Simultaneously, the general spellout was revised by establishing one ceiling of 85 cents for all crude oil below 21° gravity. The seven pools excepted from the general schedule are Dopita and Penny-Wann in Kansas, and Bald Hill, Edna Best, Pollyanna, Kellyville and Slick in Oklahoma.

Four Other Changes

1. Ceiling prices for Pennsylvania Grade oil were clarified by spelling out the ceilings at the receiving tank for six designated areas and establishing ceilings for other areas on the basis of prices in effect October 1, 1941, plus 25 cents a barrel. The six spelledout ceilings, per barrel, are: Bradford-Alleghany, $3.00; southwest Pennsylvania, $2.65; Eureka, $2.59; southeastern Ohio, $2.55; Zanesville, $2.25; Blue Rock Niagra lime sand, $2.25.

2. So that the posted purchase price of October 1, 1941, for royalty oil cannot be used as a maximum price for operators, the term "producer" is changed to "operator" in the sections defining posted purchase price and setting out the formula for determining maximum prices when specific prices are not established.

3. Where on October 1, 1941, it was the established practice in a crude oil pool to post the price for each gravity midway between each point of gravity rather than the general practice of posting for each full degree, and to adjust prices to the nearest cent for intermediate gravities, this procedure may be continued.

4. Where there are no pipe-line gathering facilities in a pool under the stripper well premium-payment plant, the maximum price for such pool is established at the price paid at the receiving tank on August 1, 1944, unless a higher price not to exceed the October 1, 1941, posted price is approved in writing by OPA.

Changes in Gas Ceiling

1. Where an increase is granted by OPA in an individual or area-ceiling price for dry gas used in carbon-black manufacture, or a new ceiling price for gas is established, ceilings of producers for other dry gas used in the manufacture of channel carbon black may not be automatically increased unless specifically allowed by written order of OPA. No increase made after June 30, 1944, will be allowed without OPA authorization regardless of the terms of any contract.

2. Sellers and purchasers have been allowed to set a tentative price for wet gas, taking into consideration value of the products extracted, condensed or saved. The scope is now extended so that consideration also can be given to any increase in the value of the extracted, condensed or saved product over the value existing at the time the contract was entered into.

OPA Details Steps in Qualifying High-Cost Pools for Premium Price

WASHINGTON. — A detailed explanation of the procedure for granting crude-oil premium prices to high-cost pools not classified as stripper wells has been prepared by the Office of Price Administration and is now being distributed with production cost forms which producers must file with the agency.

The procedure was announced briefly last week and the new statement gives additional details and makes one change in the original plan. It was first planned that the cost report forms would be sent to producers by the local stripper-well industry advisory committee, but the committees asked to be relieved of this duty so the forms will be mailed by OPA to lists of producers furnished by the committees.

The cost forms, which are relatively brief, require producers applying for a subsidy to furnish information as to various items of direct cost of production. Indirect production costs are not to be reported, since OPA has decided to adopt an arbitrary figure of 60 cents per barrel to cover all overhead and indirect costs.

OPA's statement follows in part:

Premium price adjustments will be made on a pool basis only. Average direct operating costs for a pool will be calculated from cost statements filed with the petroleum price branch of the Office of Price Administration by producers in the pool. Information on income from sales of oil and gas, direct operating costs, the production of crude oil, and the number of producing oil wells are required on the form. Such data must be filed by all producers in the pool by quarters for the four calendar quarters preceding the date a request is made that a pool be brought under the plan on a high-cost basis. Cost data in the forms will be summarized by the petroleum branch. Information relative to the payment of maximum prices in the pool will be obtained from purchasers. The amount of the adjustment in any pool will be the amount by which the sum of average direct costs of all producers in the last quarter for which data are submitted and 60 cents per barrel exceeds the present maximum price in the pool. In no case, however, will an adjustment be made unless direct operating costs are at least equal to one-third of the existing maximum prices before adjustment. Adjustments will be computed to the nearest cent per barrel.

An example of the method to be used in summarizing costs and in computing the amount of the premium price adjustment for a pool in Oklahoma in which there are three producers follows:

	Data for last quarter reported	
Producer—	Total production in bbl.	Total direct operating costs
A (20 leases)	1,800	$1,300
B (1 lease)	500	400
C (9 leases)	900	700
	3,200	$2,400

Average direct operating costs per barrel ($2,400 ÷ 3,200) ..	$.75	
Allowance for all other costs..	.60	
Total costs per barrel		$1.35
Maximum price per barrel (average gravity 36°)		1.17
Amount of premium price increase		$0.18

In carrying out this program the Office

of Price Administration will rely upon the appropriate stripper-well industry committee to ascertain the names and addresses of all producers in pools for which application is made, and to explain and assist producers in completing the forms.

Briefly stated, the procedure which a producer should follow if he believes that a pool in which he operates may qualify for a premium price adjustment under this program and the steps which the Office of Price Administration will take in processing his application are as follows:

1. The producer should write the petroleum price branch, Office of Price Administration, Washington 25, D. C., giving the name and exact location of the pool which he wishes to qualify for a premium price adjustment.

2. The Office of Price Administration will notify the appropriate stripper-well industry advisory committee of the name and location of the pool, whereupon the committee will ascertain the names and addresses of all producers in the pool, and send to the Office of Price Administration a list of such producers. The Office of Price Administration will then forward cost forms to each producer in the pool.

3. All producers should complete the form at the earliest possible time and forward one copy to the petroleum price branch, Office of Price Administration, Washington 25, D. C.

4. If any producer is not clear with respect to any requirements of the cost form, he should communicate with his industry advisory committee, the names and addresses of the members of which will be attached to the cost forms supplied each producer.

5. After the cost forms are summarized by the petroleum price branch, each producer and the stripper-well industry advisory committee will be notified of the action to be taken with respect to the pool and of the cost data which formed the basis for such action.

6. If the data support a price increase in accordance with the principles of the program, such increase will be incorporated into Revised Maximum Price Regulation 436 by written order on the first day of the month following the month in which the determination was made.

All Subsidy Pools Are Listed

WASHINGTON. — All crude-oil pools qualifying for inclusion in the stripper-well premium-payment plan as of October 1 were listed in a single document by the Office of Price Administration last week. The listing included pools originally announced, those included in about 20 subsequent orders, together with corrections and modifications.

OPA also inserted a provision authorizing the adjustment by order of prices in pools producing 9 or more barrels daily where high cost factors place the maximum oil price below average production cost, and where the production cost is not of proportion to obtainable output.

The new collation also specifies that no pool discovered after January 1, 1944, qualifies for the price increase under the premium plan unless specifically ordered by OPA. This is done because some orders are given in blanket form covering all pools in a county, state or in various counties or other broadly described area. Without this restriction, OPA pointed out, new pools not qualifying under the premium standard might adopt the increased ceiling price.

The collation also expresses basic standards used in determining which pools qualify under the premium plan. These standards are:

1. Where the daily average per well production during the month of December 1943 was less than 9 bbl.

2. And, where the daily average per well production for the 12-month period preceding date of application for increase was less than 9 bbl. and the number of wells used in the computation is determined by dividing by 12 the sum of the number of wells producing crude petroleum during each month of the 12-month period.

OPA also issued a new order this week including 26 pools to be effective November 1. The following pools will appear in the order:

Pool and county—	Cents per bbl.
Illinois	
Waggoner, Montgomery	35
Raymond, Montgomery	35
Indiana	
Prairie, Posey	25
Kansas	
All pools Elk (east half)	35
De Moss, Butler	35
Ponce, Rice	25
Soeken, Rice	35
Kuske, Sedgwick	35
Cross, Sedgwick	20
Baldwin, Douglas	35
Bird, Barton	20
Inka-Arbuckle, Pratt	35
New Mexico	
Leo, Eddy	25
Oklahoma	
March (Layton-Skinner) Payne	35
Wewoka (Hunton lime) Seminole	35
Price, Pawnee	35
Breene, Osage	35
Tull, Creek	35
Cromwell (Gilcrease) Seminole	25
Long, Hughes	25
Mobbs, Wagoner	35
Piggot, Osage, increased to	35
Kasishke South, Osage	35
Candy Creek South, Osage	35
Texas	
Blackwell, Coke	25
Wyoming	
Greybull, Big Horn	35
Pilot Butte, upper light oil, Freemont	35
Salt Creek, Salt Creek, (first, second and third Wall Creek sands and the shale sands)	20
Morrison sand remains	25

Crooks Gap Discovery Flowing 60 Bbl. Per Hour

DENVER.—Sinclair-Wyoming Oil Co. 1 State, NW SW NW 18-28n-92w, on the Crooks Gap structure in Fremont County, Wyoming, is flowing 60 bbl. per hour of 37.6° gravity sweet oil from perforations in casing opposite the Dakota at 5,232-48 ft. The well is still making some water, which may be drilling fluid not yet completely cleared up.

The well is on a 2,000-acre unitized block, government land. Phillips Petroleum Co. has a block about the same size, known as Spring Creek Unit, which adjoins the Sinclair block on the north, and is being tested. Reports are that Phillips has been having mechanical trouble and may plug and skid the rig.

New Companies Acquire Venezuelan Concessions

NEW YORK.—Millions of acres of new oil concessions are being taken in Venezuela by American oil companies under the new Petroleum Act which became effective last September. Among the principal new concessionaires are Standard Oil Co. of California and Atlantic Refining Co. These companies and a number of others already have personnel in Venezuela preparing to begin work of which most will probably be of an exploratory nature.

Phillips Petroleum Co., Amerada Petroleum Corp. and a number of other American oil organizations will also share in the new activity brought about by the granting of new areas for petroleum development. Previously, Creole Petroleum Corp., Gulf Oil Corp., Royal Dutch-Shell, Sinclair Oil Corp., Socony-Vacuum Oil Co., Inc., Texas Co., British Controlled Oilfields and Pantepec Oil Co. have been the principal operators in Venezuela.

The new activity is believed to be preparatory to a widespread campaign of oil development in Venezuela during the postwar period which is expected to bring that nation to occupy a more important place than ever before in world petroleum affairs.

Reports from the fields indicate that Socony-Vacuum is currently completing 8 Guarico, eastern Venezuela, at total depth of 10,735 ft. No. 11 Guarico has a fishing job at 6,505 ft. No. 2 Guico in the Oficina field is also fishing at 5,941 ft., while 4 Guico is rigging up.

On the Barco Concession in Colombia, Socony-Vacuum and Texas Co. continue active in the Tibu area. Socuavo 9 is standing at 5,385 ft., 10 Socuavo is testing at 5,384 ft., 11 Socuavo is testing at 5,181 ft., 12 is coring at 4,032 ft., while 13 is drilling at 3,306 ft.

In the Magdalena Valley area of Colombia, Socony-Vacuum is rigging up 6 Cantagello, while in the Sinu area Socony-Vacuum and Tropical Oil Co. are drilling 1 Floresanto at 2,312 ft.

DR. ROBERT E. WILSON | A. W. PEAKE | F. O. PRIOR | E. F. BULLARD

Wilson, Peake Elected to Top Offices of Indiana Standard

CHICAGO.—Dr. Robert E. Wilson, now president of Pan American Petroleum & Transport Co., will become chairman of the board and chief executive officer of Standard Oil Co. (Indiana), January 1 when retirement of Edward G. Seubert, president, becomes effective. Seubert will continue as a director and will be chairman of the executive committee but top executive duties in directing and marketing affairs of one of the largest companies in the industry will pass to Dr. Wilson.

A. W. Peake, vice president of Standard of Indiana, will advance to the office of president. His place will be filled by Frank O. Prior, Tulsa, now president of Stanolind Oil & Gas Co., a producing subsidiary. Prior will become a director and vice president of Standard of Indiana and will also become chairman of the board of the Stanolind Oil & Gas, Stanolind Pipe Line and Stanolind Oil Purchasing companies.

E. F. Bullard, executive vice president and director of Stanolind Oil & Gas Co., will succeed Prior as president. Bullard graduated from Yale University in 1921 and immediately entered the oil business as geologist for Dixie Oil Co. He became a director of Stanolind upon its formation in December 1930. He was elected a vice president in 1931 and became executive vice president in 1935.

Dr. Wilson will take over Seubert's responsibilities as chairman of the board of Pan American Petroleum & Transport Co., Standard's eastern subsidiary.

The reorganization is designed to relieve Seubert of the greater part of the responsibilities and burdens which he has carried and yet retain for the company the advantages of his comprehensive knowledge of its affairs, his long experience and his counsel and guidance in executive management.

Dr. Wilson was graduated from the College of Wooster in 1914 and did 2 years of advanced work in chemical engineering at Massachusetts Institute of Technology, where he was later an associate professor after coming out of the first World War a major. Standard of Indiana employed him in 1922 as assistant director of research, put him in charge of a new development and patent department in 1929, and made him a board member in 1931 and a vice president in 1933. He was transferred to Pan American in 1935 as its vice chairman and was elected president in 1937. He served as chief petroleum consultant to the Office of Production Management before Pearl Harbor.

Peake started in the oil business in 1912, the year he was graduated from Stanford University. In 1916 he went with the Midwest Refining Co., control of which was acquired by the Indiana company in 1921. He has since been with the Indiana company and its subsidiaries and has been a director and vice president since 1930.

Prior is also a graduate of Stanford. Finishing in 1918, he entered the employment of Midwest. He has been with Standard of Indiana subsidiaries ever since Midwest was acquired and has been president of Stanolind Oil & Gas Co. since its formation in 1930.

What Others Say

Zaba Series Rated High

Parkersburg, W. Va.

Dear Sirs:

We have received the back copies of articles from the Zaba series which we wrote you about on August 28. Thank you for following up on this matter.

We have checked with our engineering department, and they tell us that, in their opinion, the Zaba series on pumping practices is one of the best of its kind ever published. They have clipped and bound the entire series, and when an engineering department is this interested, you can take it for granted the articles were of more than ordinary interest and value. Very truly yours,

THE PARKERSBURG RIG & REEL CO.
S. T. Keller.

Secondary-Recovery Coverage

Washington, D. C.

Dear Sirs:

I have been especially interested in the number of articles presented in past issues of The Oil and Gas Journal relating to secondary-recovery crude-oil production operations.

As you know, the quantity of new crude-oil reserves discovered, both current and for the past several years, has not equaled the quantity consumed. In view of the constantly increasing requirements of the war program for petroleum and its products, coupled with the continued poor discovery rate, the importance of increasing both current capacity and ultimate recovery through expanded secondary recovery operations is of particular significance in the present crude oil production program. We are, therefore, most desirous of continuing the present upward trend in secondary-recovery activity.

In keeping the industry informed on the various phases of secondary-recovery operations, The Oil and Gas Journal is assisting materially in the furtherance of these operations which will be of great value in augmenting our rapidly diminishing crude-oil reserves.

Sincerely yours,
J. R. McWILLIAMS.
PAW Director of Production.

FOUNDED IN 1910

BY PATRICK C. BOYLE

The OIL AND GAS JOURNAL

Gasoline Taxes

THE Committee for Economic Development has recommended that a federal tax of 1 cent per gallon on gasoline be made a part of the postwar tax structure. The present tax is 1½ cents. This committee, as have other investigators, favors the discontinuance of other war excise taxes after peace in the interest of tax equality and because, no doubt, it is realized that there will be political repercussions if these emergency assessments are made permanent.

It is true that the federal levy on gasoline preceded the war by several years. But those responsible for its enactment have always explained that the tax was needed to bridge a "temporary" gap between income and expenditures. The gap was never closed and the tax continued until it finally became a part of the war-tax program.

The tax situation in regard to gasoline is so well known that the details do not need to be repeated here. The state levies average nearly 4½ cents per gallon, and these added to the federal levy make a total tax which is approximately 17 per cent more than the base refinery price for the product. This means that the excise tax collectors are getting more out of a gallon of gasoline than do the producers, refiners and pipe-line transporters of crude oil.

There is a very real danger that both the state and federal gasoline levies will be substantially increased in the postwar period. Much is being said about plans to increase greatly the highway facilities of the nation. Arteries across the country east and west, and north and south, are visioned. Some of the proponents are bold enough to urge that the gasoline taxes be increased to pay the costs, thus providing a "model" postwar program in which the project pays for itself.

So far as these superhighway programs are concerned, if they are finally approved, let them be paid for out of the general tax funds and more national debt as will other similar projects now being gilded before they are offered as guarantees against a postwar recession.

The present federal levy on gasoline hasn't a leg to stand on in peace times. It is an unwarranted tax on an essential product and on a business already overtaxed. Oil is one of the half-dozen major industries around which a sound postwar economy has to be built.

As to the state gasoline levies, consideration should be given to the possibilities of reducing present rates which have been in effect for several years. In some states large sums have been accumulated because of the war's curtailment of highway construction and maintenance. Other states have taken advantage of the period to reduce their highway indebtedness.

The spending of money just to be spending, a part of much postwar planning, is waste or worse and will deter rather than hasten the return to economic normalcy. In the case of highways and many other activities supported entirely or in part by petroleum dollars, investigations need to be made to determine what is required over the next 5 years. If this is done, gasoline can be relieved of part of its present tax load, and the oil business will then be in a stronger position, as the nation's cheapest and largest source of power, to do its full share in facilitating reconversion and establishing peacetime stability.

1,000-Mile Texas-California Gas Line to Cost $60,000,000

by L. P. Stockman

LOS ANGELES. — Pacific Gas & Electric Co. and Pacific Lighting Corp. have confirmed their program to bring natural gas from the Panhandle and Hugoton fields of Texas, Kansas and Oklahoma to California and application has already been filed with the War Production Board for authority to begin actual construction in 1945.

The projected natural-gas line, which will have a diameter of 27½ in., will be 1,000 miles in length and cost approximately $60,000,000. It would cross New Mexico and Arizona and would be the first interstate pipe line serving California. The two California gas companies will organize an operating company to be designated as the Texas-Pacific Pipeline Co.

Official word of the undertaking came recently from the filing of a registration statement with the Securities and Exchange Commission by P. G. & E. in connection with the issuance and sale of $115,000,000 of refunding bonds. This statement says:

"In order to augment the supply of gas available to gas companies operating in California, this company and certain southern California gas companies are now considering a plan for purchasing natural gas in Texas and transporting it by pipe line to California. Engineering and other aspects of the plan are now under investigation. Final action on the plan will depend upon results of pending investigations, completion of satisfactory gas purchase arrangements, the securing of necessary approvals by public authorities and such financing as may be deemed necessary or advisable."

Authority is also being sought from the Federal Power Commission but no difficulty is experienced along this line as there is a distinct shortage of natural gas in California, especially in southern California. Southern California Gas Co. will be the distributing agency in southern California and it is not at all improbable that some of the gas may move northward into the coastal area. This proposed pipe line is designed to tap gas fields in proved areas approximating 4,000,000 acres and having estimated reserves of 40 trillion cubic feet of gas. Western terminus of the new line would be near Los Angeles, a distance of 993 miles if the present route is taken. It is estimated four compressor or booster stations will be necessary and construction would start immediately upon receipt of authorization from appropriate government agencies.

Sponsors hope that the new line will be in operation by the winter of 1945-46 and plans are being formulated with this completion date in mind. In addition to being the first interstate pipe line in California the new installation would probably be the largest diameter long-distance natural-gas line in the country. California uses about 15 per cent of all natural gas consumed in the country and no other state is so dependent on natural gas for its fuel. This is particularly true at present as the war demands call for all available petroleum. Southern California Gas Co. officials declare that in order to insure the future growth and development of the state an adequate supply of natural gas must be assured and the underlying purpose behind the proposed new pipe line is to connect California with the largest supply of natural gas in the United States, thus giving California a dependable supply for many years to come.

Much of the project's future depends upon whether satisfactory gas-purchase contracts can be consumated and whether Texas, Kansas and Oklahoma, will permit transmission out of the states without imposing a prohibitive tax. The cost of the line must be amortized over a period of years and to do this there must be an adequate supply of relatively inexpensive natural gas in order to maintain consumer prices at about present or slightly higher levels. Natural-gas prices to consumers in California are based on the price of fuel oil. When fuel-oil markets are increased the price of natural gas rises proportionately.

NWLB Gives Approval to Severance-Pay Plan

WASHINGTON.—Approval by the National War Labor Board of a liberalized severance-pay plan submitted jointly by the Sinclair Oil Corp., New York, and the Oil Workers Union, CIO, not only will set a precedent but will be liberally interpreted by the NWLB, it was learned here last week.

The plan provides for 1 week's severance pay after 1 year of service, 2 weeks after 2 years, 3 weeks after 5 years, and 4 weeks after 10 years. About 9,000 employes are involved in the Sinclair case, and the previous contract between Sinclair and the union provided 1 week for 1 year's service and 2 weeks for 2 years or longer.

The company and the union had appealed from a ruling of the wage stabilization director which denied approval of the plan on the basis that approval or disapproval of nonwage rate adjustments should be based on the practices prevailing in the industry and area involved.

NWLB has sent out instructions to its regional offices that the precedent should be interpreted liberally. On the basis of this decision, voluntary applications providing for severance-pay arrangements may be approved by regional boards and industry commissions where such arrangements appear to be reasonable, even though they may not be consistent with industry or area practice.

The payments approved in the Sinclair case, NWLB pointed out, are not to be considered a limitation on amounts which may be considered "reasonable," nor is the decision to be considered a precedent for dispute cases.

Jersey Company Enriches Thrift Fund $3,800,000

NEW YORK. — The Standard Oil Co. (New Jersey) last week announced that a special contribution totaling approximately $3,800,000 is being distributed to its employes and those of domestic affiliates, including nearly 5,000 men and women on military leave, through the company's Employes Thrift Fund.

The special contribution, customarily announced at the time the second semiannual stockholders dividend is voted, is being paid to the trustees of the thrift fund, to be credited to savings accounts of employes who are participating in the fund. More than 90 per cent of the employes are participants.

Under the thrift-fund plan, which was inaugurated in January 1936 to help employes achieve old-age and financial security, the employe may save up to 13 per cent of his current pay. The employer matches the first 3 per cent of his savings, dollar for dollar, and adds 50 cents on the dollar for the remainder. The special contribution at this time is in addition to this regular employer contribution.

Enigmas of Wage-Hour Act Clarified by Labor Department

Numerous rulings and interpretations of the Wage-Hour Act have been handed down which affect operations of the producing branch of the industry in manners not generally realized. The Wage and Hour Division, Department of Labor, has prepared this analysis at the Journal's behest for the purpose of clarifying some of the obscure points in the regulations.

ALL workers producing goods for interstate commerce, in occupations necessary to the production of such goods, or actually in interstate commerce are now subject to a 40-cent minimum wage. The only possible consideration before both industry and the Wage and Hour Division is coverage under the act—that is, what workers are in interstate commerce or in the production of goods for interstate commerce, and what workers are not?

Coverage under the Fair Labor Standards Act, unlike some other labor laws, is determined mainly by the operation which the worker performs, not the character or scope of the employer's business. Thus, two men working on the same project may have different status under the law. One may be in interstate commerce, or producing goods for interstate commerce or necessary to the production of such goods while the second worker may not.

In an oil field, for example, the watchman is covered by the act because he is necessary to the production of goods. Although not actually producing oil himself, he is an essential aid to that production, otherwise he would not be on the payroll. Office workers who keep the books, write orders, make up payrolls, are necessary to the production of goods for interstate commerce, if the product manufactured by the firm crosses state lines, although some may be exempt as executive, administrative or professional. On the other hand a truck driver employed by a bulk oil station would not be covered if the station purchases its supplies from within the state and the driver delivers only to such consumers as department stores, schools and churches in the vicinity.

Attitude of Courts

The courts have held that the Fair Labor Standards Act, as remedial legislation, should be construed broadly and that exemptions should be narrowly defined. Thus it will be found that many workers who might be thought to be outside the purview of the act are, in fact, within it.

The metal ore, coal, petroleum and natural-gas extraction industries wage order includes, in addition to the actual mining or other extractive processes, all preceding and preparatory operations incidental to such extraction, such as prospecting and removal of overburden, as well as various types of treating or processing operations following the extraction of the minerals from the earth.

The refining or further processing of crude petroleum is excluded from the industry definition and is included in the chemical, petroleum and coal products group. Included, however, are oil and gas field services performed by contractors, covering the exploration and well-surveying work, drilling wells, running, cutting, and pulling casing, tubing and rods; cementing wells, shooting wells, perforating well casing, acidizing and other chemical treatment of wells, cleaning out, bailing and swabbing wells, drilling water wells and operating and maintaining wells.

Station and Terminal Workers

The activities of petroleum bulk stations and distributing terminals are normally covered by the act and subject to the wholesaling wage order. This group includes all stations and terminals physically storing and distributing petroleum products such as gasoline, fuel oil, kerosene and lubricants. The activities of petroleum bulk stations and terminals which are affiliated with a refiner, however, are in the main covered by the petroleum products wage order and to that extent are excluded from the wholesaling group. Independent or nonaffiliated petroleum bulk stations and terminals are included in the wholesaling group as are affiliated stations primarily engaged in selling oil and products produced by other companies. Where a refining establishment purchases a petroleum product, further refines it, and sells it as a petroleum product, even though the sale of such product is made in a wholesaling or selling department physically segregated from other departments of the establishment, it would be included in the definition of the wage order for the chemical, petroleum and coal products and allied manufacturing industries if 50 per cent or more of the sales are of products refined or processed by the refining establishment. Of course employes of such wholesalers and refiners who are subject to the jurisdiction of the Interstate Commerce Commission under the Motor Carrier Act of 1935 may be exempt from the overtime provisions of the Fair Labor Standards Act. All such employes, however, are subject to the minimum wage provisions of the act.

The construction wage order applies to those contractors who specialize in the construction of derricks or pipe lines. In this connection it might be noted that workers engaged in repair, reconstruction or maintenance of a pipe line which does not cross state boundaries are still covered under the act if the oil carried by the line goes to any plant or other type of establishment which is used for the production of goods for interstate commerce since such employes are engaged in occupations necessary to the production of goods for commerce within the meaning of the act. Pipe lines and derricks built by an oil company are considered to be part of the production operation and come under the petroleum extraction wage order, not the construction wage order.

Right of Cities Service to Keep Oil Holdings Upheld

PHILADELPHIA.—Right of Cities Service Co. to retain all of its oil business instead of being restricted to a single integrated utility system and a small part of its nonutility operations, was reaffirmed here last week by Securities and Exchange Commission.

"It is clear in light of the (Public Utility Holding Company) statute and our opinion of May 5, 1944, that Cities may fully comply with Section 11 (B) (1) by disposing of its interest in utilities," the SEC said. "Moreover, since Cities is predominantly an oil company and in any event, as we have found, would be unable under Section 11 (B) (1) to retain more than one of its utility systems, we think that Cities' decision to remain in the oil business rather than the utility business is appropriate, and in the public interest and the interests of investors and consumers."

The company told SEC that it did not intend to appeal from the commission order, electing instead "to retain its oil, wholesale natural-gas and other nonutility businesses intact and without disposing of any thereof."

Northern Ordnance Concludes Spectacular Wildcatting Program

NORTHERN ORDNANCE, Inc., will immediately discontinue further wildcatting operations. Announcements of the changes in company policy were made by John B. Hawley, Jr., president of the Northern Pump Co., and owner of Northern Ordnance, Inc., and amplified by G. S. Davidson, secretary-treasurer of the Northern Pump Co., who came to Tulsa to supervise the conclusion of operations.

Operations in proven fields will be continued from Tulsa, with Otto H. Wolfe in charge as general field superintendent, assisted by William C. Bednar, as consulting geologist and petroleum engineer. Giles A. Penick, Jr., will continue in charge of the land and lease department. District field operations will be carried on by the same staff as previously, including L. F. Browning for the Woodbine pool in Cooke County, Texas; C. W. Lobaugh in the Graham area of North Central Texas, and G. C. Griffing at Big Spring, Tex. The Kansas operations are managed by the partnership interest, Bridgeport Oil Co. of Wichita.

H. L. Scott, who has been representative in charge for Hawley, has resigned, as have also C. S. Sidwell, production superintendent in Tulsa, and R. H. Patterson, assistant superintendent for Texas. Scott will engage in business for himself as an independent operator. Davidson revealed that the status of A. I. Levorsen, Tulsa geologist and past president of the American Association of Petroleum Geologists, had been that of an independent consultant, who was asked only to consult on oil and gas matters with Hawley on various occasions.

Reasons given by Davidson for the change in policy were: (1) increasing cost of drilling; (2) difficulty of finding reasonably hopeful drilling blocks; (3) relatively small yields when a discovery was made; (4) increasing costs of operating producing properties. These factors combined to convince Hawley that further wildcatting would not be profitable. According to official statements, present plans call for continuation of drilling additional development wells, particularly including the properties acquired earlier this year in Pennsylvania.

Persistent rumors are circulating that bids for the sale of all the company's oil properties outside the Pennsylvania area are being considered.

Northern Ordnance between February 1, 1943, and October 1, 1944, engaged in the most spectacular wildcatting campaign seen in years. It is estimated to have drilled 1,000,000 ft. of hole in 16 states, the greater part of it in wildcats. At the peak, in June 1944, 103 wells were drilling, and as of October 31, 305 wells had been drilled. A wildcat success ratio of 20.8 per cent was reported, and an over-all success ratio, including development wells of 31.1 per cent. Production was obtained at Gage Dome, Montana; Woodbine pool in Cooke County, West Howard County, Crystal City in Stephens County, Rotan in Fisher County and in Victoria County, Texas. In Oklahoma the Arno Southeast pool in Creek County, the Micawber Northwest pool in Lincoln County, and an extension to the Hilltop gas field in Hughes County were successes. In Kansas, a new pool was opened in Graham County in partnership with Bridgeport Oil Co.

Northern Ordnance Buys More Pennsylvania Land

WARREN, Pa. — Northern Ordnance, Inc., of Minneapolis, has purchased 1,300 acres of oil land in Eldred Township, Warren County, from J. E. Fleming. Among the 160 wells acquired is the Atlas well, drilled in 1867 and said to be the oldest producing well in the world.

Northern's newest purchase raises to 17,000 acres its total holdings in Pennsylvania fields. These have 1,500 wells, producing 150,000 bbl. a year.

DEATHS

William Austin Tunstill, Sr., 68, died in Fort Worth October 31 after a short illness. A former rancher from Cisco, Tunstill had participated in the development of most major fields in Texas except those in the Gulf Coast area. He had holdings in 53 Texas counties. He drilled his first oil well in Big Spring in 1912, one of the first oil ventures in West Texas.

Arthur H. Craver, 74, independent oil operator of Tulsa, died November 3 at his home. He came to Tulsa in 1911, when he formed an oil company with his brother. Later he joined Noble Oil Co. as vice president, becoming an independent operator when this company was dissolved.

Fred W. Weiss, 55, a former resident of Tulsa, died last week in Pueblo, Colo. Weiss came to Tulsa when Transcontinental Oil Co. established its offices, and in 1938 Ohio Oil Co. transferred him to its Fort Worth refinery office. He moved to Pueblo in 1942 when the refinery was sold.

Thomas Midgley, Jr., 55, vice president of the Ethyl Corp., president of the American Chemical Society and vice president of Kinetic Chemicals, Inc., died November 2 at his home in Worthington, Ohio, near Columbus. He was the inventor of tetraethyl lead for depressing knocking characteristics of motor fuel and was credited with more than 100 other inventions and discoveries in chemical science. He invented Freon, a harmless gas for domestic and commercial refrigeration, and discovered a method for recovering bromine from sea water. The Midgley indicator for inspection of automobile performance was among his inventions. He was a pioneer in studies of synthetic rubber and its manufacture. He was stricken with infantile paralysis in 1940 and had been denied use of his legs since afflicted. Death apparently resulted from strangulation by a harness which he had invented to help himself in and out of bed.

Francis R. Forster, 69, an executive of Journal Oil Co., died October 26 in Bradford, Pa. He was a graduate of Cornell University.

Andrew B. Slimp, 82, retired oil man and business leader, died November 2 in San Antonio. He organized Pioneer Oil & Refining Co.

James Arthur Hull, 74, Tulsa oil man and civic leader, died at his home November 4, after a lingering illness. He came to Tulsa in 1908, after having worked westward in the oil business from Pennsylvania through Ohio, Indiana, Illinois and Kansas. He organized and headed the J. A. Hull Co., pioneer oil company in the area, which later was acquired by Sinclair Prairie Oil Co.

Donald J. Wallace, 60, safety engineer for Sinclair Prairie Oil Co., since 1934, died November 5 in Tulsa. Formerly with Humble Oil & Refining Co., in Houston, and later with Mid-Continent Oil and Gas Association, Wallace was widely known for his work in accident prevention. He founded Petroleum Safety Council and was its first president. He was a past chairman of the petroleum section of National Safety Council.

Charles Durbin, 59, oil man of Drumright, Okla., died November 6.

Field Tests Are Necessary to Evaluate Lubricating Oils

*by V. A. Kalichevsky and F. C. Savage**

Actual full-scale field or road testing is the only method by which lubricants can be evaluated with any degree of accuracy, these authors aver. They believe also that boundary lubrication is present in all bearing operations. Anti-weld agents are added to lubricants to reduce heat generation; metal-to-metal seizure is associated with alloy formation between the metals involved. Additives are employed to improve the lubricant in pour-point depression, oiliness, oxidation inhibition, detergency to remove decomposition products or foreign matter; anti-rust and antifoam reagents add to the serviceability of the lubricant.

LUBRICATION presented little if any problem in the past when industry was in its infancy. Wide bearing clearances and low operating temperatures permitted satisfactory operation with almost every available substance of suitable viscosity, and even the viscosity itself could be varied within wide limits without detriment to the machinery. However, modern mechanical developments introduced a number of complications in this field of human knowledge and stimulated intensive studies of lubricating oils, their composition, methods of manufacture, and service performance. The amount of information accumulated along these lines in the course of the last few decades is tremendous but, as it is usual in science, the realm of the unknown expanded instead of contracting.

The subject of lubrication is concerned with the science and art of reducing the frictional resistance occurring at the surface of two solids when they are forced to slide over each other. Any substance inserted between two sliding surfaces for the purpose of lessening the friction is called a lubricant. We may visualize three conditions which may occur when the two solid substances are forced to slide over each other:

1. The two surfaces are separated by a relatively thick film of lubricant. The friction between the surfaces is dependent on the internal resistance or viscosity of the fluid, and the resulting phenomena are easily analyzed by the laws of hydrodynamics covering the field of "fluid lubrication."

2. The two surfaces are separated by a very thin film of lubricant adhering to these surfaces. The observed phenomena do not obey the hydrodynamic theory of lubrication and are as yet not completely analyzed and understood. They are treated separately under the general heading of "boundary lubrication."

3. The two surfaces are in direct contact with each other. As no lubricant is present this condition results in bearing failures. The related phenomena are frequently referred to as "dry lubrication."

Friction Governed by Viscosity

In fluid lubrication a perfect adhesion is assumed to exist between the lubricating film and the sliding surfaces. The resulting friction is, therefore, entirely governed by the viscosity of the lubricant. This type of lubrication exists in machinery where load, speed of rotation, viscosity of the lubricant and some other factors, such as the finish of bearing surfaces, are kept within certain limits. Under ideal conditions the thickness of the film may be reduced to 1/40,000 in. while still

KALICHEVSKY

SAVAGE

As general assistant to the technical director for Magnolia Petroleum Co. since June 1944, Dr. V. A. Kalichevsky comes to the position through a varied career. Graduating from California Institute of Technology with a B.S. in chemical engineering, he served as research chemist and in supervisory capacities for Standard Oil Development Co. and Socony-Vacuum Oil Co., Inc., from 1924 until his connection with Magnolia. A member of American Chemical Society and American Petroleum Institute, he has been active in the development of chemical methods of refining, and has written two A.S.C. monographs, "Chemical Refining of Petroleum," and "Modern Methods of Refining Lubricating Oils," as well as the book, "The Amazing Petroleum Industry." Born in Russia, he was educated first in the Russian War College, was an active officer in the Russian Army in 1917 and later, was in the White Russian Army in Siberia in 1919-1920, and has been given several battle awards.

Assistant technical director for Magnolia Petroleum Co., Francis C. Savage reached that position by a series of steps. Graduated from University of Florida in 1932 with a degree of B.S. in chemical engineering, he became in turn chemist, assistant chief chemist, and supervisory process engineer for Magnolia. He was made assistant technical director to P. L. Smith early this year. His most active professional affiliation is American Chemical Society.

*Technical department, refining division, Magnolia Petroleum Co., Beaumont, Tex.

maintaining perfect fluid lubrication.

Recent investigations question existence of ideal fluid lubrication conditions. Boundary lubrication is claimed to be present in all bearings,[15] and the effect of metals is also believed to be always considerable.[4] This does not diminish, however, the practical value of the hydrodynamic theory for designing machinery which operates within certain performance limits.

For practical application the lubricant suitable for fluid lubrication must answer several requirements. These requirements vary with the type of service, but may be generally enumerated as follows:

Viscosity.—To insure minimum friction without incurring the danger of metal-to-metal contacts.

Stability.—To prevent deterioration of lubricant in service.

Low volatility.—To minimize losses of lubricant through evaporation and to reduce fire hazard with inflammable materials.

Inertness towards metals of which the engine is built.—To insure low wear and corrosion.

Properties of Lubricants

Lubricants applied under fluctuating temperature conditions or at low temperature levels must possess the following additional properties to insure the ease of pumping and supplying lubricant to bearings:

High viscosity index. — To minimize change in viscosity with temperature.

Low pour point.—To secure low congealing temperature.

In boundary lubrication it is first necessary to establish the region within which these phenomena take place. Equations developed for fluid lubrication include the dimensionless parameter:

$$\frac{ZN}{P}$$

where:

Z = absolute viscosity, (F) (T) $(L)^{-2}$

N = number of revolutions per minute, $(T)^{-1}$

P = load per unit of projected area, (F) $(L)^{-2}$

When this parameter is plotted against observed friction, the theoretical curve derived for fluid lubrication and shown in Fig. 1 does not coincide with the experimental data beyond a certain minimum value for ZN/P. This minimum point on the curve separates the region of fluid lubrication from that of boundary lubrication.

As already mentioned, viscosity of the lubricant determines friction between the two sliding surfaces. However, in boundary lubrication substances having the same viscosity may have a different effect on the friction coefficient. This required the introduction of a new concept—"oiliness," a rather evasive property which cannot yet be formulated in standard units. The present definition of oiliness refers to that property of the lubricant which causes a difference in friction when two lubricants of the same viscosity at the temperature and pressure of the film are used under identical conditions. The lubricant giving less friction is considered as the one possessing greater oiliness. An important aspect of oiliness is its dependence not only on the lubricant itself but also on the materials forming the bearing surfaces including their finish. Superfinish increases the load-carrying capacity without seizure[16] although in some instances it appears possible to increase friction by having an extra highly polished surface.[16] The method of preparing and cleaning the surfaces is, therefore, of much importance in oiliness measurements,[3] particularly because a surface dulled by oxidation or similar phenomena changes considerably its load-carrying capacity.[16] Different results are likewise obtained by varying the nature of the surrounding gas atmosphere.[5] The addition of a trace of oxygen to the clean metal has been shown to result in an immediate reduction in friction, while hydrogen or nitrogen had little or no effect.[5,7] In other series of experiments oxygen appeared to be more or less inert, hydrogen and nitrogen increased friction while carbon dioxide reduced considerably both friction and wear.[5] The same experimental work demonstrated that the presence of water vapors changed uniform sliding of metal surfaces to sudden jumps. Similarly, violent jolts were reported when the gas was changed from hydrogen to oxygen, but not from oxygen to hydrogen. The rate of wear changed with the nature of the gas, but not always in the same direction as the friction coefficient. These various phenomena are ascribed to the adsorption of gases by metal surfaces or to formation of water by the action of oxygen on hydrogen adsorbed by the metal.

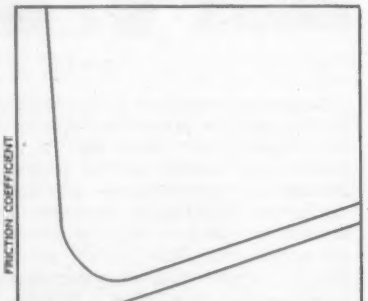


Fig. 1: Journal-bearing performance

Contrary to the conditions encountered in fluid lubrication, a decrease in viscosity of the lubricant in boundary lubrication results in an increase in friction. This generates additional heat which cannot be removed by freely circulating the lubricant through the bearings. The viscosity of the film is thus further reduced causing additional rise in friction.

The lubricant employed in boundary lubrication must possess several additional properties besides those enumerated under fluid lubrication. One of these properties is satisfactory oiliness which would minimize the danger of seizure, or metal-to-metal contacts. However, some protection is needed for preventing freezing of bearings if metal-to-metal contacts are inadvertently established. This is secured by adding an antiwelding agent to the lubricant. The presence of such substances determines suitability of lubricants for boundary lubrication.

High Temperature Developed

The necessity of introducing antiwelding agents in the lubricants intended for boundary lubrication is explained by the extremely high temperatures which are developed on rubbing dry metals against each other. Experimental work demonstrated that with two different metals forming the respective rubbing surfaces, the ultimate temperature reached by bearings corresponds to the melting point of the lower-melting-point metal. This is reasonable, as excess heat cannot be removed from the bearing at the same rate as the heat is produced, and this excess of heat must be absorbed by the latent heat of fusion of the metal itself. True seizure is thus associated with formation of alloys between the bearing metals.[11] The melting point of the softer constituent and not the crystal structure alone are thus important for design purposes. The antiwelding agent present in the lubricant hinders formation of alloys and insures continuous performance even under extremely severe conditions of service.

A rather interesting observation on ultimate temperatures reached by rubbing surfaces has been recently made employing solid films of saturated hydrocarbons, normal alcohols and normal saturated acids.[14] With the first two series of compounds transition from continuous sliding to stick-slip motion occurred at the melting point of the substance tested. With acids the transition occurred at about 135° F. (75° C.) above their respective melting points which suggests that the difference might be ascribed to the strength with which the polar group

is attached to the steel surface.

Lubricating problems confronted by the petroleum industry are thus both of physical and chemical nature. The modern view tacitly assumes that a lubricant is composed of a variety of substances some of which are present in very small quantities although they are capable of imparting certain definite characteristics to the main bulk of the lubricating fluid acting as a carrier.[1,9] Some of these substances may possess more than one of such characteristics and are of multifunctional type. Previously the existence of these types of compounds has not been recognized and lubricating oils were prepared by subtractive refining methods or, occasionally, by hydrogenation. This served to eliminate the undesirable constituents or to transform them into desirable ones. No attempts were made to improve the oil quality by addition of small quantities of highly potent synthetic compounds, and best grades of lubricants were prepared by applying optimum quantities of reagents to selected fractions of crude oils. However, isolated observers noted that some of the constituents removed from the oils were of a highly desirable type, and that the product could be improved in some respects if they were reincorporated into the oil. These early ideas finally culminated in the development of a large variety of additives which greatly improved the over-all quality of petroleum products.

Additives Influence Technique

Rapid development of additives in the course of the last few decades had a considerable influence on the refining technique. Complete removal of some crude-oil components, like wax, became superfluous because their undesirable effect on quality of finished products can be suppressed by means of additives. Whenever additives are employed, refining is carried out with the purpose of securing maximum additive response rather than optimum performance in the absence of additives. This frequently requires overtreating in order to homogenize the oil chemically and thus facilitate selection of additives. The degree of refining varies, however, with the type of additive used, source of crude oil and product specifications. The source of crude oil still remains an important factor because physical and chemical characteristics of refined mineral-oil products have a definite influence on additive performance.

In selecting optimum treating conditions certain complications arise with respect to practical problems. Additives may be depleted in service and partially or completely removed by filters and similar mechanical devices intended for keeping the oil free from suspended matter. For this reason, a compromise is usually made, and the oil used as a carrier is refined to a level at which it has good additive response but retains sufficient stability to prevent its rapid deterioration in the absence of additives. Reclamation of oils containing additives is obviously an impossibility without reincorporating the additives particularly suitable for each individual type of oil.

A large variety of additives is now available for industrial uses, and their number continues to grow rapidly. The most important of these additives may be classified as follows:

Pour-point depressants are very high molecular-weight substances approaching asphalt in some of their characteristics. Asphalt has pour-point depressant qualities but its presence in finished products cannot be tolerated because of carbon-forming tendencies and black color. The action of pour-point depressants is attributed to their ability of modifying the crystal structure of wax. In their presence wax precipitates in small crystals and does not form the usual complicated crystal network interfering with the free flow of occluded oil.

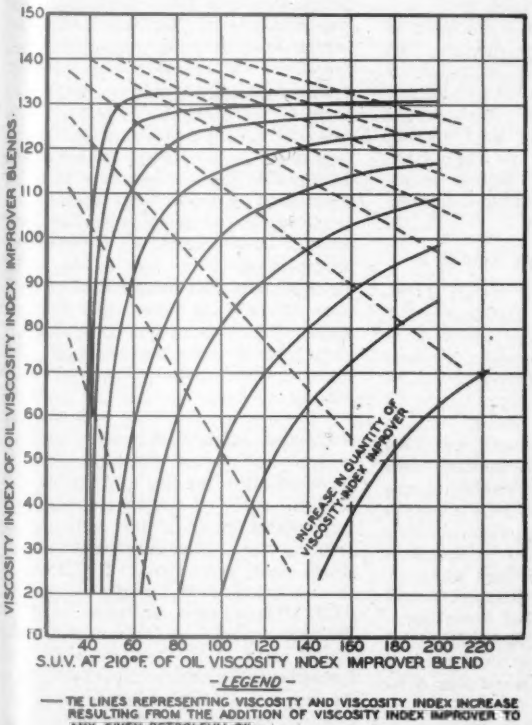
Viscosity-index improvers are also high-molecular-weight compounds and, for this reason, frequently possess pour-point-depressant qualities. They are added to the oil in quantities considerably greater than those commonly recommended for pour-point depressants. Their action depends on the peculiarities of the viscosity-blending characteristics and variations in the viscosity index with the oil viscosity. In general, the viscosity of a blend at any given temperature is lower than the arithmetical average of the viscosities of its components. These discrepancies are less for lower than for higher viscosities. The divergencies of actual viscosities of blends from arithmetical averages are in the direction that produce higher-viscosity-index oils than may be expected otherwise. The greater is the difference in viscosities of the two oils, the greater is the deviation in the viscosity index of the blend from the average. The viscosity index of the heavier component has a greater influence on the viscosity index of the blend than the viscosity index of the lighter component.

Viscosity Index Limits

Blends containing viscosity index improvers show rather interesting relationships as demonstrated in Fig. 2. The maximum viscosity-index limit of blends varies with the type of oil and the type of viscosity-index improver employed thus affording an easy method for evaluating quality of viscosity-index improvers.

Oiliness carriers are represented by compounds which have the ability of forming tenacious films on metal surfaces. The desired effect is obtained by using very small quantities of such compounds because they tend to concentrate at the oil-metal interphases. Even a single layer of such molecules attached to the metal surface causes a remarkable decrease in friction.[2] However, in practice the quantity of oiliness carriers added to an oil is considerably larger than this theo-

(Continued on page 93)


VISCOSITY INDEX OF OIL VISCOSITY INDEX IMPROVER BLENDS
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
40 60 80 100 120 140 160 180 200 220
S.U.V. AT 210°F. OF OIL VISCOSITY INDEX IMPROVER BLEND
INCREASE IN QUANTITY OF VISCOSITY INDEX IMPROVER
-LEGEND-
— TIE LINES REPRESENTING VISCOSITY AND VISCOSITY INDEX INCREASE RESULTING FROM THE ADDITION OF VISCOSITY INDEX IMPROVER TO ANY GIVEN PETROLEUM OIL
--- 5% (VOL.) INCREMENTS OF VISCOSITY INDEX IMPROVER CONTAINED IN OIL VISCOSITY INDEX IMPROVER BLENDS

Courtesy T. A. Petry, Research and Development Division, Socony-Vacuum Oil Co., Inc.

Fig. 2: Generalized viscosity-index relationships of petroleum oils in blends with viscosity-index improver

Causative Agents of Corrosion In Distillate Field

*by Paul L. Menaul**

THE problem of internal corrosion encountered in flow lines, well-head equipment, and tubing in the gas-condensate fields recently has been in considerable prominence. The corrosion, found extensively along the Gulf Coast in high-pressure distillate wells, is more than a minor problem in maintenance of equipment. It is actually a hazard to continued production in some of the fields. Inspection and replacement of damaged tubing and well-head equipment, including cost of work-over jobs in these high-pressure wells, will be a factor in the economic value of the fields. The importance of this specific problem was pointed out by W. T. Johnson at the 1944 meeting of the National Association of Corrosion Engineers.

The corrosion found and remedial measures taken in the Opelika field, Texas, has been discussed,[1] with the conclusion that, despite the absence of identifiable corrosive compounds, the appearance of the corroded parts indicated direct chemical attack. The remedy tried was the introduction of soda ash and sodium hexametaphosphate solution into the well. While this treatment reduced the iron content in the water produced from 150-300 p.p.m. down to 5-30 p.p.m., the well production was shut off, presumably by the formation of scale. Treating the well with hydrochloric acid restored production.

Papers presented by W. F. Rogers and F. W. Jessen at the above conference included data which indicated that corrosion in distillate wells is primarily caused by water made acid through solution of carbon dioxide, and may be correlated with the dissolved carbon dioxide of the water.

Another paper[2] on the problem discussed the effects of corrosion found on distillate-well equipment and described the extent to which this form of corrosion endangers continued operation, stating that this particular type of corrosion occurs in the absence of any known corrosive agents, with the possible exception of carbon dioxide.

This particular form of corrosion is extremely unpredictable. Some wells in a given field will apparently be free from any sign of corrosion while other wells will corrode with extreme rapidity, yet an analysis of the products of the wells will show no appreciable difference in the per cent of carbon dioxide. The fact that "the severity of corrosion encountered in condensate wells is not consistent with the carbon dioxide in the production," as has been stated,[3] makes it likely that the causative agents of this corrosion problem have escaped detection.

*Stanolind Oil & Gas Co.

The author is on the chemical staff in the production research section of Stanolind Oil & Gas Co.'s research department. He received his A.B. and M.S. degrees from University of New Mexico and continued his post-graduate work at University of Illinois. He was with the experiment station of Oklahoma A. & M. College, 1920-26; research chemist for Chickasha Cotton Oil Co., 1926-35. Later he was in research and field laboratory work with Halliburton before joining Stanolind 2 years ago.

Heating Increases Acidity

A sample of water from the 8,600-ft. sand in the South Jennings field, Louisiana, showed a pH of 5.73 as produced, but after heating the water to 200° F. for a few minutes to expel dissolved carbon dioxide, it was found that the acidity of the water had increased to pH 4.8. This lowering of the pH (increasing acidity) was found to be characteristic of the water produced in the South Jennings and Katy distillate fields when they were heated to the boiling temperature for a few minutes. At this temperature, dissolved carbon dioxide is expelled from solution. If acidity was due to dissolved carbon dioxide, there would be a shifting of the pH toward the neutral reaction.

For these waters to show increasing acidity after heating is characteristic of the hydrolysis of an iron salt of an organic acid. For example, iron acetate will hydrolyze in a hot dilute solution to basic iron acetate, which precipitates from solution and to free acetic acid, which causes the reaction of the solution to become more acidic, according to the equation:

$$Fe(C_2H_3O_2)_3 + HOH$$

$$= FeOH(C_2H_3O_2)_2 + HC_2H_3O_2$$

A typical chemical analysis of the Katy water causing corrosion is shown in Table 1.

TABLE 1

	P.p.m.
Ca	15
Mg	2
SO_4	44
Cl	156
CO_2	110
Fe	140

The noticeable odor of organic acids in the water and the significant decrease in pH on heating lead to a more comprehensive investigation of the water produced in the South Jennings field, Louisiana, and the Katy field, Texas, in the research department laboratory of Stanolind Oil & Gas Co.

Five gallons of water from the Katy field, which by chemical analysis was found to contain 137 p.p.m. iron, was heated to 200° F. for a few minutes to expel dissolved carbon dioxide. The water was then made alkaline to pH 9 with sodium hydroxide and filtered to remove the precipitated iron hydroxide. The clear filtrate was evaporated to dryness. Care was used in the last stages of evaporation that no organic matter was decomposed. The dried residue was extracted with anhydrous ethyl ether to remove any hydrocarbons. This residue was extracted with hot ethyl alcohol which had been freshly distilled from alkaline media, to dissolve the sodium salts of organic acids and separate them from the bulk of inorganic salts. The ethyl alcohol extract was evaporated to dryness, then treated with a slight excess of cold 20 per cent sulfuric acid to liberate organic acids from their sodium salts, and this solution extracted with anhydrous ethyl ether. On evaporating the ether extract, 5 g. of strongly acidic liquid was obtained which had the unmistakable odor of valeric acid.

Upon distilling, the boiling point of this liquid ranged from 110° C. to 190° C. which corresponds to the boiling temperatures of the mixed

organic acids, formic, acetic, propionic, butyric and valeric.

The organic acids recovered from the Katy water was 0.25 g. per liter or 250 p.p.m. It is very difficult to recover organic acids from such a dilute solution in a quantitative amount so the recovery was probably not more than 60 per cent as there was considerable loss due to volatilization and incomplete extraction of the formic-acetic acid fraction.

Neutralizing Equivalent

On examination of this material, the neutralizing equivalent was found to be 74; this means that the average molecular weight of these acids is 74, which is the molecular weight of propionic acid. On further examination, the material was found to have the reducing reactions characteristic of formic acid and to form the difficultly soluble anilide compounds on reaction with aniline.

For simplicity in calculating, these mixed acids can be referred to as propionic acid, since it has been shown the average molecular weight of the mixed acids is that of propionic acid.

The iron content of the Katy water was 137 p.p.m. and if it is assumed that this amount of iron was in solution as ferrous propionate, $Fe(C_2H_5CO_2)_2$, the required concentration of propionic acid ion would be 360 p.p.m.

An electrometric titration of the Katy water, Fig. 1, Curve 1, shows an acidity of 380 p.p.m. calculated as propionic acid.

The electrometric titration of acids with sodium hydroxide gives information as to the type of acid being titrated. A tenth normal solution of these acids obtained from the Katy water was prepared, using 74 as the average molecular weight. The electrometric titration of this solution with tenth normal sodium hydroxide, Curve 2, shows the characteristic curve obtained by titrating aliphatic acids.

The corrosive property of these organic acids on iron was compared to the corrosive property of propionic and caproic acids. One-liter solutions each of propionic and caproic acid were prepared to pH 4.5, and one-liter solution containing the acids extracted from Katy water was made to pH 4.9. Not enough of these acids remained (less than 0.3 cc.) to reduce the pH of 4.5 The corrosive property of these three solutions of organic acids to mild steel shows them to be comparable, Table 2.

TABLE 2—CORROSION OF MILD STEEL BY ORGANIC ACIDS AT 150° F.

Solution—	pH	Loss in mg./sq. in./day
Propionic acid	4.5	12.1
Caproic acid	4.5	9.9
Acids extracted from Katy water	4.9	7.4

The corrosive property of a dilute solution of these acids extracted from the Katy water was found comparable to the corrosive property of a similar dilute solution of propionic acid, when exposed to filings of mild steel, for 12 hours, Table 3.

TABLE 3—SOLUTION OF MILD STEEL BY ORGANIC ACIDS AT 150° F.

Solution—	Per cent	Concentration of iron in solution (p.p.m.)
Propionic acid	0.1	383
Acids extracted from Katy water	0.1	320

A logical treatment for the stoppage of the corrosive action would be the introduction into the well bores of a volatile alkali such as ammonium hydroxide. This would neutralize the organic liquids and form ammonium salts of the various acids.

The possible origin of these organic acids that are found in the production from deep wells may be considered. The chemical analyses of the produced waters show a low content of dissolved solids. If these waters were produced in the vapor phase from a brine, the salt of the brine would be left in the formation near the well bore which would soon be made evident by plugging of the well by salt deposition. Since this does not seem to be the case, we can assume that these are waters of low salinity, corresponding to fresh-water lakes or marshes where much vegetable decay could occur. It seems probable that these organic acids were formed by decomposition of organic materials in waters of marshes before subsidence and burial.

At the high temperature of the producing formation, the vaporization of these acids and their presence in the distillate is to be expected as the distillation with steam is a common laboratory method of the examination of organic acids.

Other Sources of Acids

Other possibilities as to the source of these organic acids have been suggested. There is the possibility that they are present in the oil and become concentrated in the water production because of better solubility. Their origin by present bacterial action would seem unlikely on account of the high temperature of these wells, although this possibility is not completely ruled out, pending studies by bacteriologists. The origin of these acids through the reaction of carbon dioxide with the hydrocarbon gases is a possibility.

Whatever the source of these acids, it has been established that they are present in the water produced in the South Jennings and Katy fields and are likely responsible for the corrosive properties of these waters.

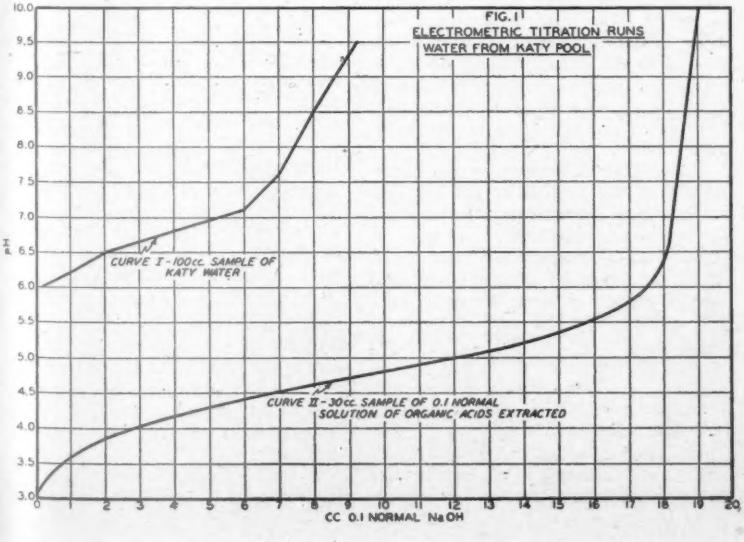


FIG. 1
ELECTROMETRIC TITRATION RUNS
WATER FROM KATY POOL
CURVE I - 100cc. SAMPLE OF KATY WATER
CURVE II - 30cc. SAMPLE OF 0.1 NORMAL SOLUTION OF ORGANIC ACIDS EXTRACTED
CC 0.1 NORMAL NaOH

Acknowledgment

The author expresses his appreciation to the management of Stanolind Oil & Gas Co. for permission to publish this article.

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Erland J. Anderson, district petroleum engineer, Humble Oil & Refining Co., has been transferred from Tomball to Livingston, Tex.

Paulsboro T.C.C. Unit Features Solid Catalyst Bed

View looking northeast showing barometric support, instrument and utility building and No. 2 fuel tank on right, T. C. C. structure on left

by J. P. O'Donnell

An improved catalytic-cracking unit employing solid catalyst bed type reactor arrangement is discussed in this article. Catalyst bed for cracking is normally 7 ft. deep, for treating cracked distillate is 35 ft. deep. Catalyst flow rate is set generally at 100 tons per hour. The volume of catalyst in the reactor when cracking is about 1,400 tons, for treating is 7,000 tons. Change reactor design is made possible by use of bead type catalyst.

CONTINUED progress in the art of catalytic cracking is illustrated by the new Thermofor unit which recently went on stream at the Paulsboro, N. J., refinery of Socony-Vacuum Oil Co., Inc. This 11,000-bbl.-per-day unit is the first to employ the solid-bed principle in both the kiln, or regenerator, and in the reactor. Adoption of these developments makes this unit simpler in design than its predecessors and also increases its flexibility.

Solid-bed-type reactors are now in use at refineries of General Petroleum Corp. and Richfield Oil Corp. on the West Coast and at refineries of Pure Oil Co., Crown Central Petroleum Corp., Ashland Oil & Refining Co. and Continental Oil Co. The last four were designed as angle-type units but were changed during construction to the solid-bed type by eliminating angle packing.

This solid-bed type kiln will also be used in the Standard Oil Co. of California, Union Oil Co., Sun Oil Co. and Tide Water Associated Oil Co. units now nearing completion and the Richfield Oil Corp. units which were completed in September. Older kilns, like the older reactors, enclosed angle structures since they were also designed originally to handle a granular catalyst.

Like the older kilns, the new one consists of alternate burning and cooling zones. However, whereas the former varied from 7 to 10 burning zones, the latter consist uniformly of 10. The bead or pelleted catalyst which they will handle is admitted to the kiln through distributor pipes and is removed through a baffle system in the bottom that insures a uniform flow of the catalyst.

The major difference is the elimination of the angles in the burning zones thus permitting the use of the solid-bed principle. Air for regeneration is introduced through a series of air-inlet channels located in the center of each burning zone and passes upward and downward through the solid bed of catalyst to outlet channels which exhaust it to the flue gas system. Plain tube coils instead of K-fin tube coils are now used in the cooling zone.

Not only is better contact between the air and catalyst attained through this design but greater residence time is also a result. The residence time may range from 5 to 7 minutes in each of the zones except the bottom one where it is 20 minutes. Thus the total residence time in the kiln may be as high as 83 minutes.

Air rates and temperatures are controllable so that the degree of burning can be regulated. This is particularly important in the uppermost zone where hydrogen is burned off selectively at lower temperatures than those prevailing in lower zones. This is done to prevent formation of steam which may have a damaging effect on the activity of the catalyst. The unit is equipped with a temperature-plotting instrument giving an instantaneous record of temperatures at various levels.

Auxiliary equipment includes an inert gas generator to provide gas for use as a sealing medium in the top of the kiln to prevent the loss of vapors. It also has a catalyst preheating system to heat the catalyst and remove any moisture before it is admitted to the unit.

Possibly the principal advantage

resulting from the use of the solid-bed principle in the reactor is the simplification in design. However, there is an important advantage in the increased flexibility which is attained and the potential advantage in the reduction in the amount of internal elements so that if it became necessary to handle sour stocks, the alloying of the interior would be greatly reduced.

The increased flexibility results from the fact that the catalyst bed can be adjusted either for cracking or treating by lengthening or shortening the distributor pipes and thereby decreasing or increasing the depth of the catalyst bed. The depth of the bed for cracking is, normally, 7 to 8 ft., and for treating, 35 ft. This automatically varies the space velocity which is, normally, 1.8 for cracking and 0.4 for treating.

Presence of the angle grids in the old type reactors prevented any variation in the depth of the catalyst bed so that a change in space velocity desirable in changing from cracking to treating, for example, could be accomplished only by a reduction in throughput. This change is not only possible in the solid-bed operation but it is also possible to vary the space velocity in a smaller degree if the change from one type of stock to another, such as from naphthenic to paraffinic gas oil, is necessary.

Variation in the space velocity is a function of the depth of the catalyst bed in relation to the volume of oil charged and, in T.C.C. operation, is independent of the rate of catalyst flow. The latter is governed by the capacity of the elevator system between the reactor and kiln and is normally set at a maximum of 100 tons per hour. In the reactor at Paulsboro, which is 16 ft. in diameter, the volume of the catalyst in the kiln during cracking is 1,400 cu. ft. and for treating, 7,000 cu. ft.

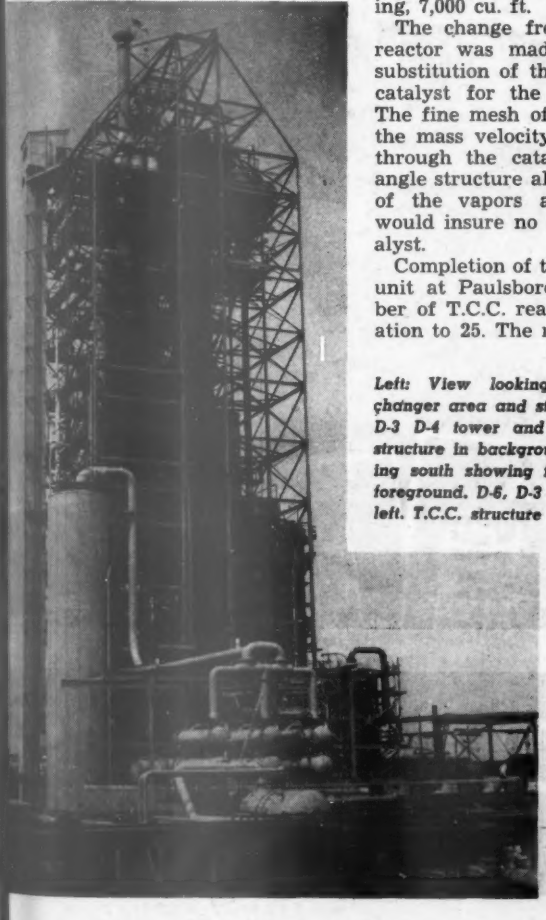
The change from the angle-type reactor was made possible by the substitution of the bead or pelleted catalyst for the granular catalyst. The fine mesh of the latter limited the mass velocity of the oil vapors through the catalyst bed and the angle structure allowed free passage of the vapors at a velocity that would insure no boiling of the catalyst.

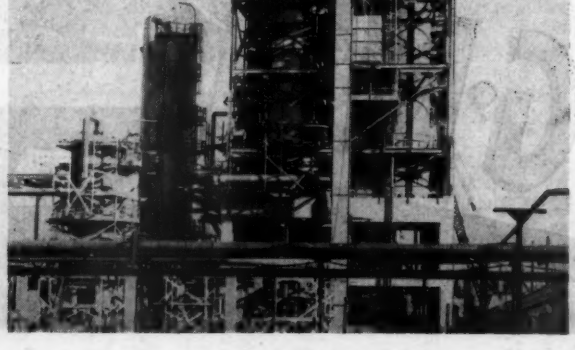
Completion of the Socony-Vacuum unit at Paulsboro raised the number of T.C.C. reactors now in operation to 25. The remaining nine under construction are due for completion within the next 2 months. Those built or building for Standard of California, Richfield, Socony-Vacuum at Paulsboro, Sun, Union and Tide Water have solid-bed reactors while single angle-type units already built for Pure Oil, Crown Central, Ashland and Continental were converted to solid-bed operation before starting up and are being used as treaters. The units at the Union and Richfield refineries consist of twin reactors served by a common kiln and elevator system.

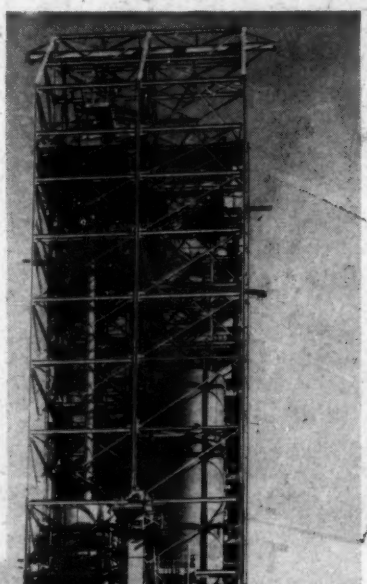
A complete list of T.C.C. units is given in the accompanying table.

Company and location	Reactors	Capacity (bbl.)
Standard Oil of California, Richmond	*2	28,000
Richfield Oil Corp., Wilmington	4	30,000
Socony-Vacuum Oil Co., Paulsboro	1	11,000
Sun Oil Co., Marcus Hook	*2	22,000
Union Oil Corp., Wilmington	*4	30,000
Tide Water Associated Oil Co., Bayonne	*1	11,000
General Petroleum Corp., Torrance	4	44,000
Magnolia Petroleum Corp., Beaumont	2	20,000
Socony-Vacuum Oil Co., East St. Louis	1	10,000
Gulf Oil Corp., Port Arthur	3	27,000
Pure Oil Co., Smith's Bluffs	2	20,000
Crown Central Petroleum, Houston	2	20,000
Ashland Oil & Refining, Ashland	2	20,000
Sinclair Refining Co., Houston	1	10,000
Continental Oil Co., Ponca City	3	30,000
Total	34	333,000

*Not yet completed.







Left: View looking west showing exchanger area and structure in foreground. D-3 D-4 tower and D-6 tower at T.C.C. structure in background. Right: View looking south showing fresh clay elevator in foreground. D-6, D-3 D-4 and D-2 tower on left. T.C.C. structure in center

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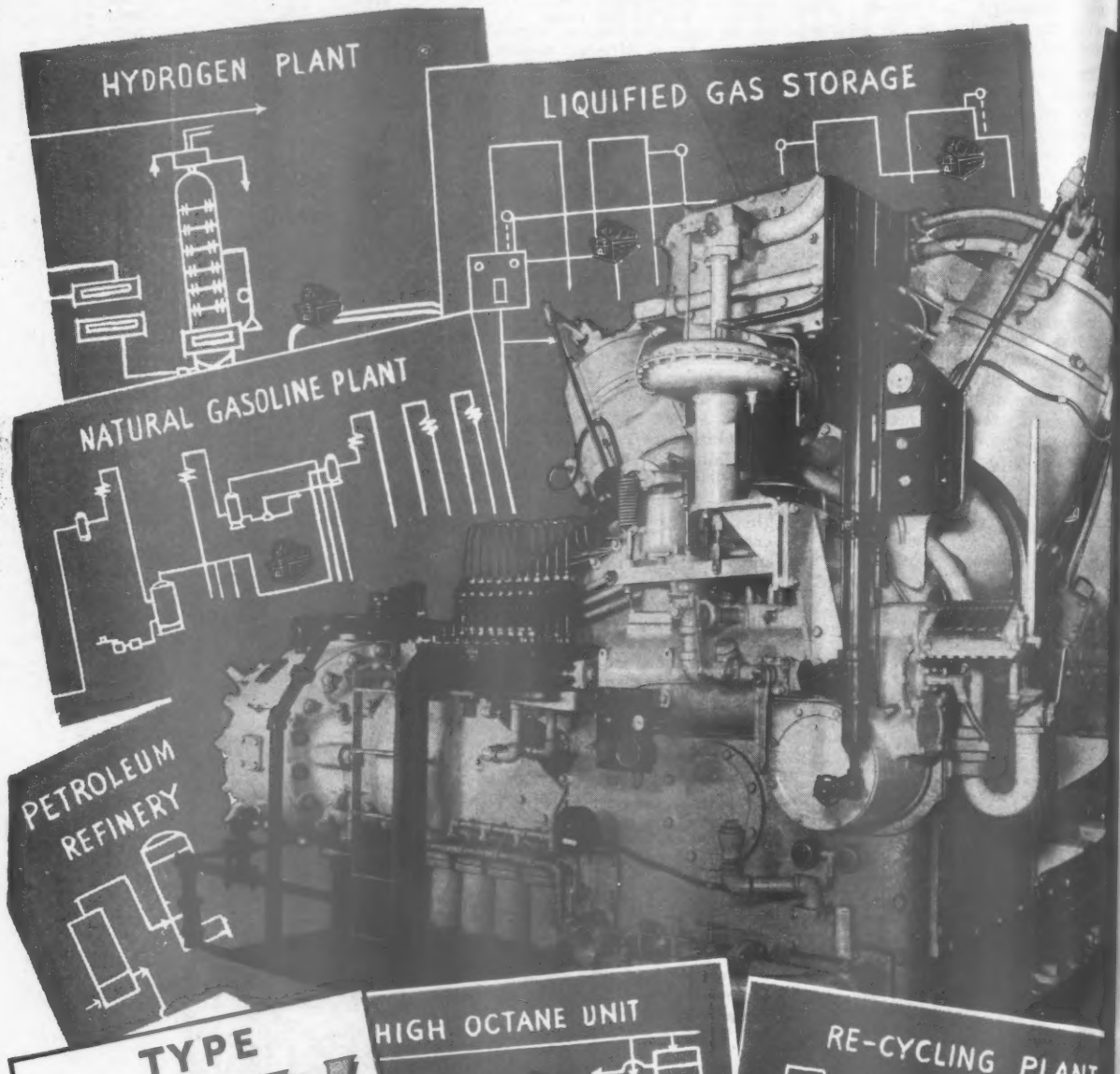

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Mechanics of Producing Oil, Condensate, and Natural Gas

Porosity, Number of Voids, And Surface Area

NO. 2 OF A SERIES

*by Park J. Jones**

Sediments such as sandstones, shales and limestones are called media. Media are classified as pay and nonpay. Pay contains reservoir fluid of which some is recoverable commercially. Nonpay does not contain commercially recoverable reservoir fluids.

Porosity means interconnected voids. The size and distribution of voids in pay seem to control rate of recovery and ultimate recovery. The distribution of voids may be uniform as in well-sorted sand, or it may be nonuniform as in limestones having cavernous porosity. Voids may be visualized as openings between particles interconnected by necks. The necks interconnecting voids are irregular in shape and length. They taper down to capillary dimensions near the points of contact between particles.

Surface area per unit of porosity is significant. Silt, for example, is not pay because of its comparatively vast surface area. Surface area and the size and number of voids probably account for most of the variation in water saturation in pay.

MEDIA may de designated as those of mechanical deposition and those of chemical and organic deposition. The latter include carbonates of which limestones and dolomites probably contain more than 3,000,000,000 bbl. of proved oil reserve. Other media of chemical and organic origin are silicates, ferruginous and carbonaceous sediments, evaporites and still other miscellaneous sediments.

Media of mechanical deposition are classified on the basis of particle size. (See Table 2-1.) Unconsolidated media are called gravel, sand, and mud. Gravel and sand are qualified by the name of the dominant particle size. Mud may be silt or clay.

Consolidated media of mechanical deposition are called conglomerate, sandstone and mudstone. Conglomerates and sandstones are qualified by the name of the dominant particle size. Mudstone may be siltstone or claystone. Fissile siltstones and claystones are called shale.

Characteristics of Particles

Characteristics of particles are classified under composition and texture. Composition is designated by the mineral, or rock-type name of particles. Texture includes the following characteristics:

A. Structure of particles: Crystailine, amorphous, oolitic, concretionary and organic.

B. Grain size: Arithmetic average of particle long, intermediate and short, dimensions.

C. Shape: Estimated from the ratios of intermediate - to - long and short-to-intermediate dimensions.

D. Roundness: Angular, subangular, subround and round.

E. Surface relief and luster: Rough to smooth and dull to glossy.

Still other characteristics of particles are their distribution and orientation in media. Composition and texture of particles together with small-scale structure of media control porosity, permeability and surface area.

Small-Scale Structure

Small-scale structure of media includes fractures, joints, stratification, cementation, solution and deformation structures other than joints and fractures. A detailed discussion on structure is beyond the scope of this work. However, a few statements on cementation and solution may be included.

Cementation is accomplished by the deposition of a substance which will bond particles. The principal bonding materials of interest to producers are lime, silica, and mud. Cementation tends to reduce surface area, number of voids, and porosity. The volume of bonding material may be less, equal, or greater, than the porosity of noncemented particles. When the volume of bonding material exceeds the porosity of noncemented particle aggregates, the bonding material becomes a matrix. Sandy shale is an example. The composition and texture of surface area may vary because of cementation.

Solution structures in limestones and dolomites include stylolites, pinpoint porosity, honeycombed porosity, and cavernous porosity. Solution tends to reduce surface area and number of voids. Solution tends to increase the permeability of media.

Porosity of Spherical Aggregates

The porosity of media consisting of uniform spherical grains is determined as follows: Consider eight uniform spheres of diameter d, four directly on top of four others. Imagine a cube through the centers of the eight spheres. One-eighth of each sphere is within the cube. The volume of the cube is d^3. The volume of the spheres plus voids is also d^3. The volume of the spheres is $\pi\ d^3/6$ or $0.524d^3$. The volume of the voids is $0.476d^3$. Whence, the corresponding porosity is 47.6 per cent. The foregoing arrangement of spheres is called cubical packing. It represents the most porous type of packing.

Next, move an edge of the cube until one sphere is placed in the center over four others. The cube becomes a rhombohedron. Its volume is $0.707d^3$. So the volume of the spheres plus voids is also $0.707d^3$. As the volume of the spheres is $0.524d^3$, the volume of the voids is $0.183d^3$. Whence, the corresponding porosity is 183/707 or 25.9 per cent.

*Production consultant, Houston.

TABLE 2-1.—CLASSIFICATION OF MEDIA BASED ON PARTICLE DIMENSION

Particle size (in.)	Particle name	Name of aggregate: Unconsolidated	Name of aggregate: Consolidated
Greater than 0.1	Gravel	Gravel	Conglomerate
0.1-0.04	Very coarse sand	Sand	Sandstone
0.04-0.02	Coarse sand	Sand	Sandstone
0.02-0.01	Medium sand	Sand	Sandstone
0.01-0.005	Fine sand	Sand	Sandstone
0.005-0.0025	Very fine sand	Sand	Sandstone
0.0025-0.00016	Silt	Silt	Siltstone*
Less than 0.00016	Clay	Clay	Claystone*

*Fissile siltstones and claystones are shale.

This arrangement is called rhombohedral packing. It represents the least porous type of packing.

Porosity of Pay

The porosity of spherical aggregates is independent of particle size. Fine round sand and coarse round sand have identical porosities, if there is no difference in packing. The particles comprising pay are not spheres. They range from round particles, oolites, to mica-like plates. Nor is the particle size uniform. In addition, most clastic pays usually contain some bonding materials. As a consequence, the porosity of pay varies widely. Commonly, from 10 per cent up to 35 per cent.

However, the porosity of limestone and dolomites having pinpoint structure may be less than 10 per cent. And the porosity of calcareous media having honeycombed or cavernous structure may be greater than 35 per cent.

The porosity of pay such as conglomerate, fractured shale, weathered igneous and metamorphic rocks, varies considerably. Estimates of porosity for such pay are uncertain.

Surface Area of Spherical Aggregates

The number of acres of surface area per acre-foot of rhombohedrally packed spherical aggregates is defined by

$$S = 53.3/d \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where

d = diameter of uniform spherical grains, inches
S = acres of surface area per acre-foot

Equation (1) can be derived from the data given in the section on porosity of the spherical aggregates.

The particle sizes of most clastic pays fall within the limits 0.01 in. and 0.002 in. The surface area per acre foot of rhombohedrally packed 0.01 in. and 0.002 in. spherical aggregates is 5,330 acres and 26,600 acres, respectively. (See Fig. 2-1). These values should be divided by 0.259 in order to obtain surface area per unit of porosity for rhombohedrally packed spherical aggregates.

Surface Area of Pay

The particles comprising pay are not uniform spheres. On the other hand, the surface area of pay cannot be measured. However, it seems reasonable to assume that the surface area of many sandstones lies in the region above the curve in Fig. 2-1. The surface area of sandstones in which some of the necks have been plugged by cementation probably lies in the region below the curve in Fig. 2-1.

The surface area of limestones and dolomites having honeycombed or cavernous porosity probably lies in a region which is considerably below the curve in Fig. 2-1. Some sandstones having calcareous bonding materials may also have a comparatively small surface area.

Number of Voids Per Acre-Foot

The number of voids per acre-foot of rhombohedrally packed uniform spheres is defined by

$$N = 0.106/d^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where

d = diameter of spherical particles, inches
N = billion voids per acre-foot

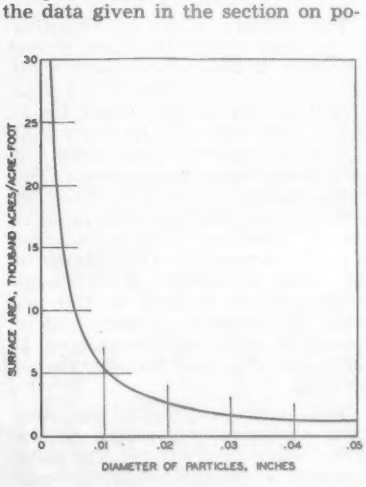

Fig. 2-1—Probable surface area per acre-foot. Curve is for rhombohedrally packed uniform spherical aggregates. Probable region for many sandstones, above curve; limestones having secondary porosity, below curve

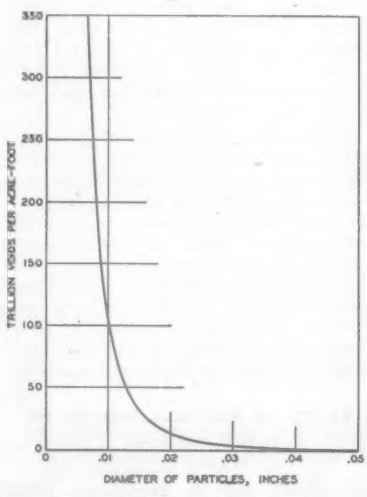

Fig. 2-2—Probable number of voids per acre-foot. Curve is for rhombohedrally packed uniform spherical aggregates. Probable region for many sandstones, above curve; limestones having secondary porosity, below curve

Equation (2) can be derived from the data on porosity of spherical aggregates.

The number of voids per acre-foot of rhombohedrally packed uniform spheres is shown by the curve in Fig. 2-2. Again, the particles comprising pay are not uniform spheres. Nevertheless, it seems reasonable to assume that the number of voids in many sandstones may be on the order of one trillion up to a 1,000 trillion per acre-foot. However, the number of voids in limestones and dolomites having secondary porosity is probably much less than the above astronomic figures.

Fig. 2-2 probably illustrates why fine-grained media may contain up to 65 per cent water. Apparently, capillary forces in very small voids exceed gravitational forces. For particle sizes like those in silt, water saturation remains at 100 per cent. The voids in silt probably are so small that capillary forces exceed gravity forces even at 100 per cent water saturation.

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Great Aviation Fuel Test Plants at Work

What is believed by its designers to be the finest aviation engine test stand ever built has been completed at the Esso Laboratories of Standard Oil Development Co., Elizabeth, N. J. It is designed with all the numerous auxiliary and accessory facilities necessary for proper testing of fuels in full-scale aviation engines up to 2,000 hp. or more. It is the first full-scale aviation engine test stand to be built by the oil industry.

Among other important items, the test cell has 16-in. walls, is 77 ft. long, 18 ft. wide, 20 ft. high. It is fitted with every device for recording or observing operating conditions of the engine and fuel, for deadening noise and vibrations. The engines are mounted on a steel ring, simulating the mounting in a plane, which ring is fastened to a huge concrete block tied into the building foundation concrete. Instruments used in the test work are based on a separate slab of concrete, to reduce vibrations from the engine.

Such plans for testing indicate clearly the magnitude of aviation as a motor fuel consumer now and in the future.

Photographs courtesy Texas Iron Works.

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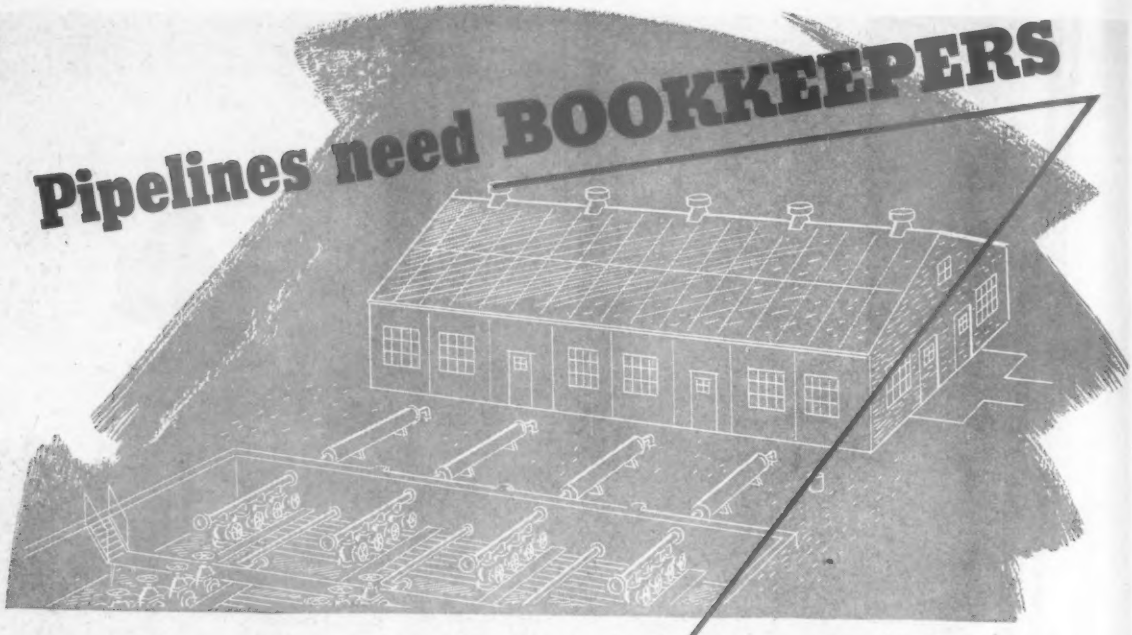

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Choke Control of Gulf Coast Wells—No. 3

by J. E. Loeffler*

Continuing his treatment of choke control of wells in this installment of a series of articles, the author discusses regulators and bottom-hole chokes. In the fourth and concluding installment, to be published next week, formulas and charts for computing choke capacities, temperature reductions, etc., will be presented.

THE use of a back-pressure regulator on the gas discharge from gas traps or separators permits the use of the gas energy for other lease operations, such as gas lift, repressuring, transportation, etc. A gas regulator also assures constant back pressure on the well and tends to reduce fluctuating and heading conditions.

When using this equipment, the best operating conditions can be gained by employing the gas regulator to maintain the proper surface back pressure and, as a standby in case of regulator failure, an adjustable choke should be available and set to operate so that pressure is still maintained on the well.

One variation of this control, known as the "nonthrottling" type, is being successfully used along the Gulf Coast. The type of regulator used is illustrated in Fig. 9. The regulator is placed on a gas well which is one of a number tied into a common gas-gathering system. The regulator-equipped well is referred to as the "standby well." Aside from the standby well, the other wells in the system produce through production chokes. The control regulator opens the standby well when pressure on the gathering system drops below a predetermined amount, and remains open until the line pressure increases to the maximum system delivery pressure desired.

*Chief engineer, Thornhill-Craver Co., Houston.

Subsurface Chokes

Pressure-control methods and equipment used within the well include special types of removable production chokes. These are called bottom-hole chokes and may be placed at any desired depth in the flow column, usually in the lower end. The diameter of the flow tubing employed and choke depth exert important influences on pressure conditions within the well.

Efficient pressure utilization is had when the gas pressure is completely spent as the fluids are discharged at the surface; this may be achieved if the choke or bean is placed in the lower end of the tubing through which the oil flows to the surface, instead of in its upper end at the christmas tree.

There are several advantages claimed for this method of producing through chokes. Less gas is required to move the volume of oil, due to the fact that the mixture of gas and oil passing through the choke under compression is released above with such an increased velocity that it creates a higher pressure differential than if the choke were not used. In this way wells may be induced to flow when not enough gas pressure is present to flow through the open tubing.

Inasmuch as the higher velocities in the lower end of the flowing column in the tubing also may correct tendency of a well to surge and may help prevent accumulation of sand, it may be possible to maintain continuously lower rates of production, which is sometimes of assistance in meeting proration requirements. Low-energy wells producing low-pressure gas or oil with a low gas-oil ratio may, by this means, continue to flow their production beyond the time when they would otherwise have to be pumped.

Not all so-called bottom-hole chokes are placed at the lower end of the flow tubing. Where wells are capable of maintaining a high submergence and where proration requirements restrict the rate of production, the choke may be placed well up from the bottom of the tubing string. There are some wells equipped with three chokes or regulators within the tubing and a surface choke at the christmas tree.

When bottom-hole chokes are used it is found desirable to maintain a slight to sometimes considerable back pressure in the tubing to reduce flow velocities and friction losses in the upper end of the tubing near the surface. In either case, it

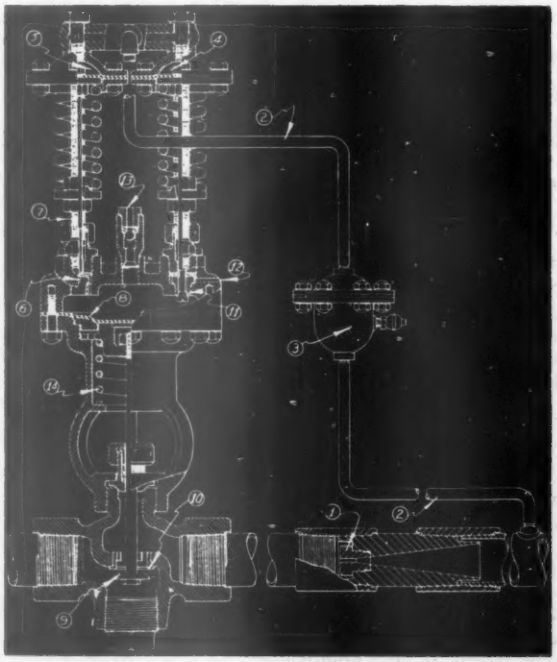


Fig. 9 (above): Cross-section of regulator used on one of a group of gas wells, for controlling pressure of system, the other wells being fitted with fixed chokes

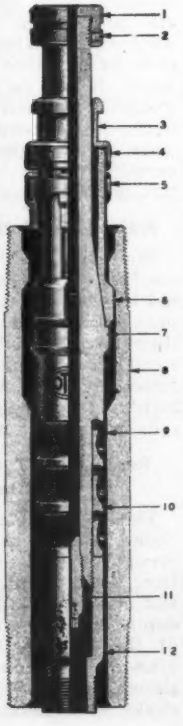


Fig. 11 (left): Cutaway diagram of bottom-hole choke showing component parts. 1—retaining nut; 2—set screw; 3—slip carrier; 4—slip carrier band; 5—mandrel band; 6—locking dogs; 7—mandrel; 8—landing nipple; 9—cups; 10—cup ring; 11—screw bean, and 12—screw bean cage

may be applied by one or the other —the surface choke or pressure regulator at the trap. Practice indicates the use of the choke, since it acts as a flow bean as well as a safety device.

Experience has indicated that for a given flow rate, the size of the opening in a bottom-hole choke should be considerably smaller than that in a surface bean. In the Mid-Continent area, the orifices have have ranged from 2/64 in. to 24/64 in. and in the Gulf Coast area the range is from 6/64 in. to 16/64 in.

Since bottom-hole chokes first came into use in about 1931, several different types have arisen to meet various conditions. These may be divided into three types: (1) fixed; (2) adjustable, and (3) replaceable. One factor in determining the type of bottom-hole choke to use is the ease of replacement. Wherever large amounts of sand are present in the flow, the wear on the bean will be excessive and the life relatively short. The replaceable type is perhaps representative of most modern types.

Fixed Types of Bottom-Hole Chokes

The fixed type of bottom-hole choke is sometimes referred to as a tubing nipple choke. This type is rigidly fixed in the flow column and can be adjusted or replaced only by withdrawing the tubing. To pull the tubing involves time and expense, and, in the case of high-pressure wells, some hazard. This has lessened their use, especially in wells producing sand with oil; however, they are very satisfactory in connection with the pumping of clean oil.

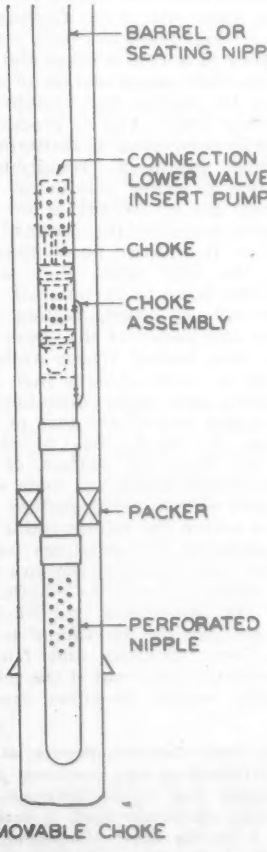


Fig. 10: Diagrammatic illustration showing application of removable bottom-hole choke

There is another kind of fixed-type choke called the tubing-disk choke. It is generally installed in wells just past the continuous flowing stage which have been placed on the pump. Such wells may produce considerable sand and shale, often plugging the tubing, unless equipped with a choke. A disk choke should be selected that will maintain the proper differential pressure to produce the well.

An important application of the tubing-disk choke is to produce a well to a predetermined daily quota. The type of disk to accomplish this is a positively placed type which screws well down into the upset collar of the tubing string at the desired depth. The threads of the disk are cut very full so that they can adjust themselves to the taper of the upset collar.

Usually three disks are installed, with the diameter of the first one calculated for the present flowing condition of the well, the second disk 1/64 in. larger, and the third 2/64 in. larger. The last two beans are installed to take care of anticipated bottom-hole-pressure conditions. The individual disks are installed with the orifice diameter increasing from the top downward, and are spaced one single tubing joint apart. When production records indicate that the top disk is too small, it can be broken out by a weight bar; then when the second becomes too small for well conditions, it may likewise be removed, permitting the well to produce through the remaining disk.

Adjustable Bottom-Hole Choke

The adjustable bottom-hole chokes are fixed in the sense that they cannot be removed from the well without pulling the tubing. However, they have an advantage over the fixed type in that they can be adjusted and compensated for wear by turning the tubing or manipulating rods which extend to the surface.

Replaceable-Type Bottom-Hole Choke

The replaceable-type bottom-hole choke, shown in Fig. 10, can be brought to the surface for inspection, adjustment, or replacement, and can be installed at any desired depth without pulling tubing. One of the prominent and typical replaceable bottom-hole chokes is shown in Fig. 11. This bottom-hole choke is mounted in a packer equipped with slips so that it can be set in the flow tubing at any desired depth. Pump cups on the assembly are expanded against the tubing by fluid pressure and effect a tight seal between choke and tubing.

The complete choke generally consists of a hollow mandrel, a set of slips, a packing element, and the replaceable bean which either fits loosely in a tapered recess or is screwed into the bottom of the mandrel. These types of chokes are of the positive type and it is necessary to change beans to alter the original size.

This choke is pulled or run by means of special tools on a light steel measuring line. To pull the choke from the well it is only necessary to run in with a special socket drive-down to release the slips, pick up and retract. Time required to pull and rerun a choke might vary from 1 hour to ½ day. A lubricator is used in connection with high-pressure wells.

In operating this type choke, the principal difficulties result from paraffin accumulations and imperfections in the tubing. Sand in the well fluid in moderate amounts has not proved troublesome, other than to necessitate more frequent replacement of the bean.

Electronic Apparatus Features Chicago Show

Electronic apparatus will be emphasized at the Chemical Exposition and Conference to be held November 15 at the Coliseum in Chicago under sponsorship of the Chicago section, American Chemical Society.

Among the several speakers scheduled to discuss "New Research Developments in Industry," which is to precede the opening of the conference, is J. K. Roberts of Standard Oil Co. (Indiana).

According to the show committee, of which M. H. Arveson, Standard Oil Co. (Indiana) is chairman, added space will expand the show to more than twice the size of the last exposition held by the Chicago section in 1942.

Included in the educational exhibits of scientific displays is the demonstration of a new low-priced electron microscope by the R.C.A. Manufacturing Co. and the General Electric Co. for the qualitative and quantitive analysis of hydrocarbons; the National Technical Laboratories is to exhibit a new infrared spectrophotometer; the Central Scientific Co. is to show a complete line of photoelectric photometers including the Beckman quartz prism spectrophotometer.

Among the exhibits of electronic precision industrial instruments will be a potentiometer recorder, shown by the Brown Instrument Co.

Field Tests Necessary to Evaluate Lubricating Oils

(Continued from page 79)

retical minimum in order to insure adequate protection. As the oiliness carriers are effective because of their ability to form thin films on metal surfaces, a certain attraction should exist between them and the metal. For this reason the potency of these additives should be evaluated with reference to the metal used in bearing construction. Oiliness carriers are needed only in boundary lubrication, but claims are advanced that they are also helpful under conditions of fluid lubrication.[4] The common types of oiliness carriers are represented by mild organic acids and their esters as well as by the compounds of sulfur and chlorine.

Oxidation inhibitors protect the oil from deterioration in contact with air. The action of oxygen is frequently accelerated by the presence of metals. As engines consist of metals the retarding action of oxidation inhibitors may arise from two different causes: protection of the oil itself from oxidation in direct contact with air, and immunization of metals by destroying their catalytic action through formation of protective surface coatings. In selecting the second type of inhibitors care should be exercised in avoiding the use of substances which may disintegrate the bearings and cause unnecessary wear. The usual types of oxidation inhibitors are represented by hydroxy, nitrogen, and sulfur compounds.

Detergents may be defined as substances which assist in removing the foul or offending matter from the working mechanisms. In the engines they should remove sludge and carbon deposits. This removal may be accomplished either by keeping the sludge in suspension in the oil or by changing the dense carbon deposits into fluffy ones, thus permitting their easy elimination from the upper piston and combustion chamber of engines. Some detergents may act as oxidation accelerators at the temperatures prevailing in the combustion zone, thus facilitating burning of heavy oil fractions if they happen to pass through the piston rings. Such substances should be inert, however, at lower temperatures prevailing in other parts of engines.

Detergents Represented

Detergents are represented by a variety of metalloorganic compounds such as compounds of barium or calcium. The action of detergents and their use depends to a certain extent on the nature and quantity of oxidation inhibitors employed. If the oil is stable to oxidation, less sludge is formed and the problem of keeping it in suspension becomes of less practical importance.

In describing the action of oxidation inhibitors, detergents, and similar additives no reference has been made to the addition agents present in fuels and to their effect on lubricating-oil stability. Sufficient information has been accumulated in the course of the last decade to demonstrate that addition agents in gasoline have a definite influence on the lubricating-oil performance. For this reason, fuels used in engine tests should be of uniform quality.

Antifoaming agents came into prominence with the development of certain types of additives conducive to foaming. In practice, foaming tendencies of oils are greatly reduced in the absence of moisture. Foaming also decreases after the oil has been for some time in service. The antifoaming agents are represented by certain silicon compounds.

Antirust agents are used in special grades of lubricating oils. These agents facilitate formation of a tenacious oil film on the metal surfaces protecting them from direct contact with moisture. This protection is of particular importance when the machine is idle or when certain parts of the machine are only in occasional contact with the oil.

Coloring and fluorescent bodies are primarily of sales value and are employed in order to conceal color of the oil or presence of dissolved and suspended sludge from customers' eyes.

Selection of additives depends not only on their performance but also on compatibility. Products containing additives must be compatible under service conditions because more than one product may be used in the same engine.

Lubricating oils are evaluated on the basis of physical and chemical tests, engine performance, and field service. Some of the test methods are well standardized and widely accepted by the industry, while others are of local importance. The relative value of tests varies with the service for which the oil is intended. The most frequently applied

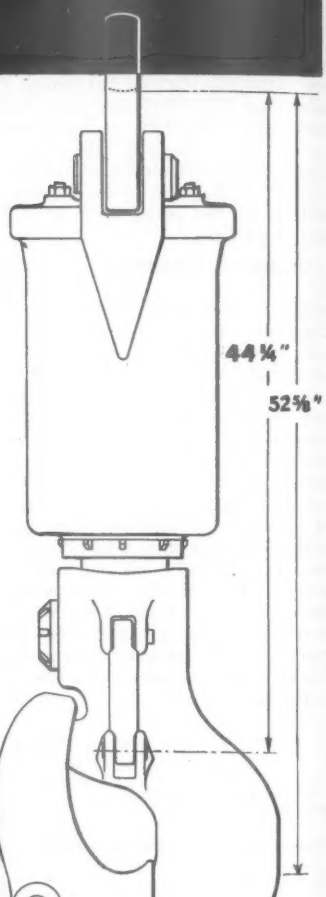
TABLE 1—COMPARISON OF LABORATORY AND SERVICE TESTS

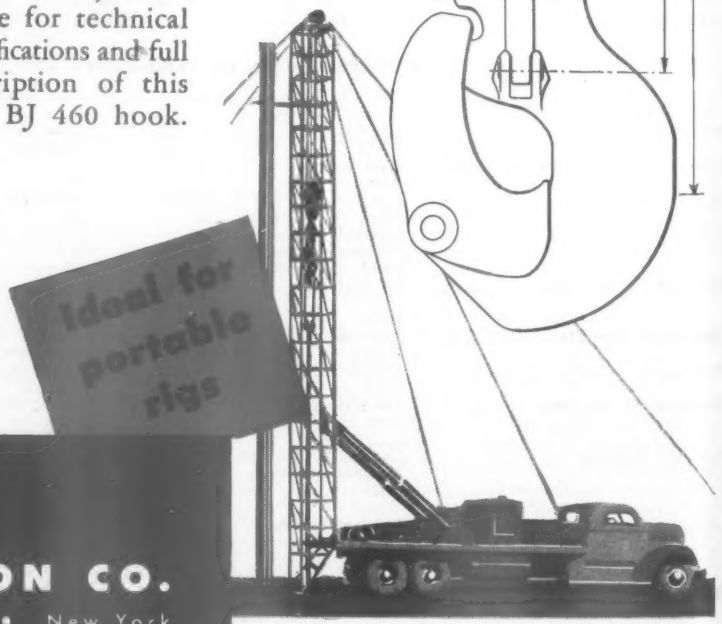
Phase of performance—	Test location—	Oil designation A	B	C	D	E
Bearing corrosion	Laboratory	Severe	Moderate	None	None	None
	Field	Severe	Moderate	None	None	None
Number of rings stuck per engine	Laboratory	2	3	3	0	0
	Field	4	9	8	2	2
Oil ring deposits	Laboratory	Heavy	Moderate	Moderate	Light	Light
	Field (% closure)	50	60	65	0	45*
Airport deposits	Laboratory (No. of cleanings required)	1	2	0	0	0
	Field (% closure)	0	15	10	25	15
Ring wear, g. per cyl.	Laboratory	.....	.....	No data available	.....	.....
	Field	0.96	3.02	3.84	2.41	.....
Piston skirt deposits	Laboratory	Moderate	Heavy	Heavy	Moderate	Moderate
	Field	Moderate	Moderate	Moderate	Moderate	Moderate
Ring groove deposits	Laboratory	Heavy	Moderate	Moderate	Moderate	Moderate
	Field	Normal	Normal	Normal	Normal	Normal
Deposit above top ring	Laboratory	Moderate	Moderate	Moderate	Moderate	Moderate
	Field	Light to moderate	Light to moderate	Moderate	Moderate	Moderate to heavy
Purolator deposits	Laboratory (No. of changes required)	2	1	3	0	1
	Field	Trace to light	Light	Moderate	Trace	Trace
AC filter deposits	Laboratory (No. of changes required)	2	2	2	2	2
	Field	Clean to light	Heavy	Heavy	Clean to light	Light to moderate
Used oil examination	Laboratory	.....	.....	No appreciable oxidation		.....
	Field	.....	.....	No appreciable oxidation		.....

*Many compression rings found broken, heavy oil ring deposits probably attributable to high blowby rate.
Note: Field tests on oil A terminated prior to 60,000 miles because of bearing failure.

New BJ SUPER TRIPLEX 460 HOOK

The new BJ 460 is short—only 44 inches in working length—and with direct connection to the traveling block more space is saved. But it is rated at a full sixty tons with a 4 to 1 safety factor. The BJ 460 is the only "engineered" hook—designed with a minimum of waste—with 100 percent rated ball bearings and low stressed relief springs, assuring ease of operation—it operates to the highest performance standard. It is the right hook for use with all portable masts—drilling, cleanout or production jobs... Write for technical specifications and full description of this new BJ 460 hook.





BYRON JACKSON CO.

Houston • LOS ANGELES • New York

tests may be summarized briefly as follows:

Viscosity: Determines suitability of an oil from standpoints of power and oil consumption and prevention of metal-to-metal contact; claims have been advanced that cylinder and ring wear are almost inversely proportional to kinematic viscosity[9] although this is questionable in view of other more important factors encountered in practice and influencing the wear problem; intermittent service demands the use of oils of low temperature susceptibility, i.e., high viscosity index.

Pour point: Indicates temperature at which solidification of oil occurs due to crystallization of wax or approach of viscosity to infinity and determines ease of handling oil in containers and ability of lubricant pumping systems to create oil flow; laboratory tests are not necessarily conclusive because the size and shape of vessels, rate of cooling, sample history and similar factors affect the results.

Flash point: Supposed to indicate volatility, fire hazard, and oil consumption.

Gravity: No practical significance; in transformer oils, which are of nonlubricant type, gravity determines the ability of ice to sink instead of accumulating on the oil surface.

Demulsibility: Indicates ease with which water separates from the oil; correlations between the various demulsibility tests and practical performance is, in general, very unsatisfactory, particularly because of adverse effect of service contamination on ease of water separation; some products such as soluble cutting oils must be capable of forming stable emulsions for proper service.

Carbon residue: Supposed to indicate carbon-forming tendencies of oils but fails in this respect because of inability to differentiate the nature of carbon deposits; the test is helpful, for preliminary laboratory testing and permits detection of residual stocks in lubricating-oil blends.

Color: Has little significance for most practical purposes, but may be useful, within broad limits, in determining uniformity of various deliveries of a given oil.

Oxidation stability: Of large variety of the existing laboratory oxidation tests is in itself an indication of the impossibility of reproducing service conditions on a small scale; tests are only of limited practical value.

Less frequently applied tests include:

Oiliness: Important for lubricating machinery with small clearances and operating at high bearing pressures and low speeds; also for lubricating machinery with a reciprocating motion; in automobile engines oiliness is generally important only for the break-in oils.

Rust prevention: Required from oils used in certain types of machinery, such as turbines.

The enumerated laboratory tests are inadequate for evaluating performance of lubricating oils under actual service conditions and may be expected to give only general information on over-all oil quality. Methods have been developed, therefore, for testing oils under simulated service conditions. Reproduction of field conditions in the laboratory is, however, not always possible, because of diversified nature of service and time factor. Engines differ in their characteristics even if they are made by the same manufacturer. Small changes in operating conditions, quality of fuel, mechanical assembly and other variables cause considerable differences in test results. For securing reproducibility comparisons should be made employing the same engine and a large number of blank and duplicate runs.

Another difficulty encountered in laboratory engine tests is the necessity of operating them under artificially created and frequently highly accelerated conditions. This does not necessarily correspond to normal field practice where the engines are used under a variety of conditions including differences in the operator's technique. Table 1[17] illustrates variations which may be encountered in comparing results obtained in the laboratory and in actual service. Table 2[18] referring to five oils listed in the order of decreasing merit leads to similar conclusions.

These comparisons show that field testing is the only answer to oil-evaluation problem although, unfortunately, it cannot be resorted to indiscriminately because of the expense and time involved. The described complications in evaluating oil quality may also explain the reason why the public in general prefers to buy oils by brand names backed by many years of practical experience in developing superior products.

The present article deals primarily with problems connected with bearing lubrication. Problems connected with other types of lubricants such as cutting or emulsifiable oils, greases, etc., will be covered in another article which will appear at a later date.

TABLE 2—COMPARISON OF LABORATORY AND ROAD TESTS

Test—	Position of oil in order of decreasing merit				
Road test engines SAE 30	1	2	3-4	4-3	5
Mechanical laboratory engines SAE 20	4	2	1	5	3
Modified Underwood test SAE 20	1	4	2	5	3
Modified Underwood test SAE 30	2	4	1	3	5
Oxygen absorption test	2	1	4	3	5

Acknowledgment

The writers would like to express their appreciation to J. W. Newton, W. W. Leach, and P. L. Smith for permission to publish this manuscript and for the encouragement received in the course of its preparation.

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Costs of Fischer-Tropsch Gasoline

INTERESTING figures are given by R. P. Russell, executive vice president of Standard Oil Development Co., before the Senate subcommittee on war minerals, on the comparative costs of gasoline by coal hydrogenation and by the Fischer-Tropsch synthesis from coal and natural gas. According to these figures, the cost of gasoline from coal by hydrogenation, presumably a la Bergius or the German I. G. Farbenindustrie methods, ranges from 15.5 cents in large (30,000-bbl.-per-day) plants, to 22.6 cents in small, 3,000-bbl.-per-day units, using coal at $2.75 per ton. The Fischer process using coal gives gasoline for 19.2 cents per gallon, about four times that of petroleum gasoline. With natural gas as the charging stock Fischer methods can produce gasoline now at 8.8 cents per gallon; if suitable development is carried out, Russell states that this synthesis will make gasoline for 4.8 cents per gallon.

MODERN DRILLING

A JOURNAL SERIES ON NEWEST DEVELOPMENTS IN ROTARY RIGS

Mechanical Specifications

Portable Rig's Model CT-5 Rig

Specifications

Rated capacity: 6,000-ft. drilling depths, and greater where used for well servicing.
Prime movers: Two or more 150-hp. diesel, gasoline or natural gas, engines.
Drum flanges: 40 in. diameter by 10 in. wide.
Brake lining: 1⅛ in. thick by 10 in. wide.
Drum center: 18 in. diameter by 30 in. wide.
Drum shaft: 6½ in. diameter heat-treated alloy steel.
Drum clutches: Cone type. Clutch in each end of drum. Hydraulic engagement and release.
Drum drives: (High) 2-in. pitch single width roller chain. (Low) 2½-in. pitch single width roller chain.
Drum shaft bearings: Heavy duty roller type.
Brake Rigging: Patented, nonkicking, allowing 90 per cent braking area in contact.
Line shaft: 4½ in. diameter . . . no torque transmitted through line shaft; serves as chain tightener and cathead purposes only.
Line shaft bearings: Heavy duty roller type.
Rotary shaft: 4½-in. heat-treated alloy steel.
Rotary shaft bearings: Heavy duty roller type.
Rotary clutch: Cone type: Hydraulic engagement and release.
Rotary shaft drive: 1¾-in. pitch double width roller chain.
Transmission: Four speeds forward; three reverse; heavy duty herringbone type; lubricated under pressure by same system as rest of draw works.
Lubrication: Force feed throughout on all chains and bearings.
Controls: All conveniently located at driller's position.
Speeds: Five on drum, four on rotary.

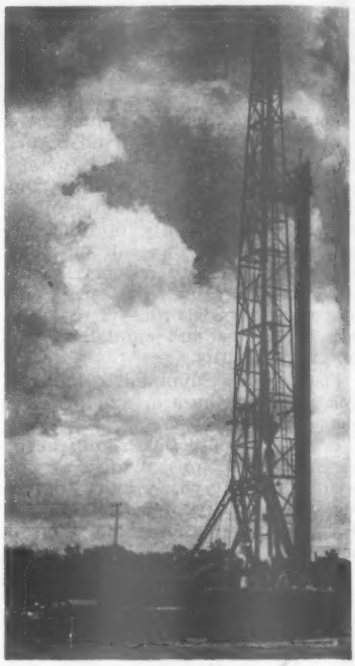
Salient Features

THE clutch on the Portable CT-5 rig has been modernized. Engagement and release is accomplished by hydraulic pressure controlled by foot pedals at the driller's position. This provides much speedier and more efficient clutch operation than is obtainable in the standard plate clutch. The cone construction and constant hydraulic pressure compensates for lining expansion and contraction, thus giving exceedingly efficient operation, regardless of either of these, and of course lining life is considerably increased.

Completely Enclosed Draw Works

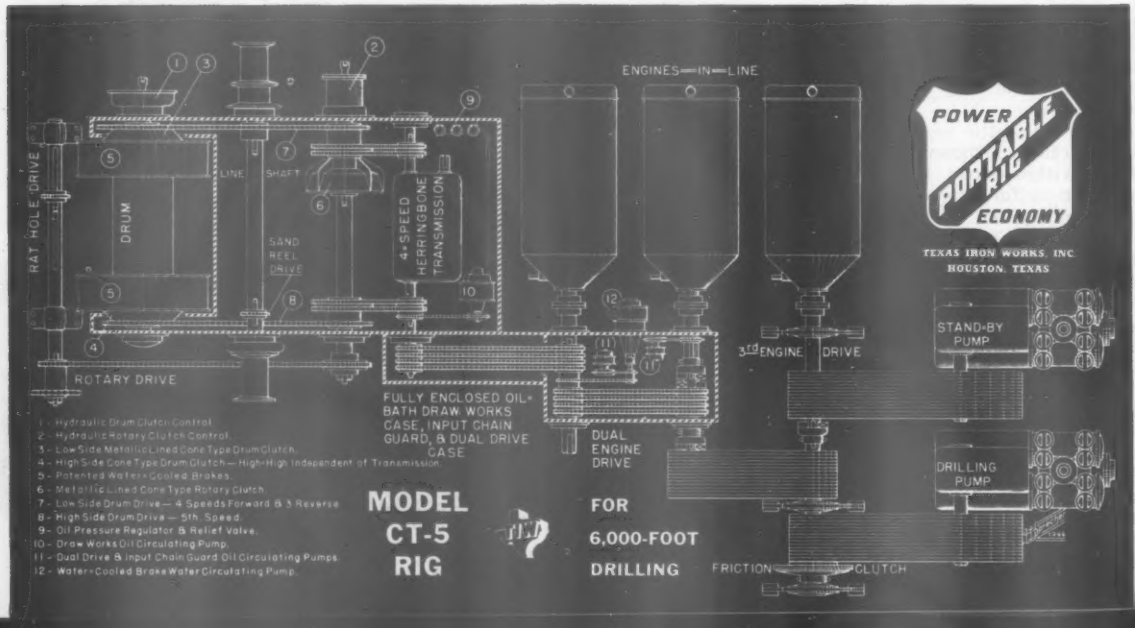
This unit may be mounted above or on the same level with the engines and dual engine drive.

The high-speed-drum drive is direct from input shaft on transmission, through idler sprocket on rotary shaft, to the drum. It is controlled by separate cone-type friction clutches on the rotary side of



Portable Rig Co.'s Model CT-5 rig with three engine drive on a Hinkle-Bailey Drilling Co. rig with modern jack-knife derrick in a Gulf Coast field which was last reported drilling below 6,600 ft.

Schematic drawing of rig layout, showing in-line arrangement of engines, drives to pumps and compounding of the three engines through the regular dual engine drive. Also other salient features of the rig


ENGINES—IN—LINE
RAT HOLE DRIVE
DRUM
LINE SHAFT
SAND REEL DRIVE
4-SPEED HERRINGBONE TRANSMISSION
ROTARY DRIVE
3rd ENGINE DRIVE
STAND-BY PUMP
DRILLING PUMP
FRICTION CLUTCH
FULLY ENCLOSED OIL-BATH DRAW WORKS CASE, INPUT CHAIN GUARD, & DUAL DRIVE CASE
DUAL ENGINE DRIVE
POWER
PORTABLE RIG
ECONOMY
TEXAS IRON WORKS, INC.
HOUSTON, TEXAS
1 - Hydraulic Drum Clutch Control.
2 - Hydraulic Rotary Clutch Control.
3 - Low Side Metallic Lined Cone Type Drum Clutch.
4 - High Side Cone Type Drum Clutch — High-High Independent of Transmission.
5 - Patented Water-Cooled Brakes.
6 - Metallic Lined Cone Type Rotary Clutch.
7 - Low Side Drum Drive — 4 Speeds Forward & 3 Reverse.
8 - High Side Drum Drive — 5th. Speed.
9 - Oil Pressure Regulator & Relief Valve.
10 - Draw Works Oil Circulating Pump.
11 - Dual Drive & Input Chain Guard Oil Circulating Pumps.
12 - Water-Cooled Brake Water Circulating Pump.
MODEL CT-5 RIG
FOR 6,000-FOOT DRILLING

the draw works. It provides a high-high speed entirely independent of the transmission. It is ideal for hoisting light loads and running empty blocks to the top of the derrick.

The low speed drum drive from hub on sprocket of cone-type rotary clutch gives four forward and three reverse speeds to drum. The low speed drive is also controlled by cone clutch on driller's side of drum.

Drive to rotary shaft is from output drive shaft of transmission to hub of rotary clutch to shaft. It provides four forward and three reverse speeds to the rotary table. Drive from transmission shaft to rotary clutch hub is by double width roller chain.

Oil pump drive is from input shaft of transmission to rotary shaft. This drive is independent of transmission speeds and assures ample pressure at all times.

The triple duty regulator assembly reduces high pressure from pump to regulated pressure to clutch controls, drum and rotary; reduces high pressure to regulated pressure to all moving parts for lubrication; provides safety valve for both systems.

The transmission input sprocket is quadruple width, pressure lubricated, machine cut and heat treated.

Dual Engine Drive

The sub-bases for the two engines are constructed of "H" sections with cross members and braces electrically welded to form an integral unit. The base is of sufficient length to support the drive between the engines for compounding both to either the draw works or pumps. All shafts in dual drive are mounted on roller bearings and all bearing, sprockets and chains are lubricated by force feed. The dual engine drive is entirely encased in a welded steel housing. The engines are connected by flexible couplings. The engine clutches are operated by hand levers located at driller's position. The third engine ties into the dual engine drive by a V belt from the engine shaft to a 5 7/16 in. diameter heat-treated alloy-steel shaft which extends from the dual engine drive. This third engine also drives the drilling pump through V-belts from engine shaft to pump and provision is also made for V-belt drive from the engine shaft for the stand-by pump.

Drive compounding the engines is 1¼-in. pitch quadruple width roller chain. The pump drive sheave on the dual engine drive is 14-in. pitch diameter 14 groove "D" section, mounted on two roller bearings. Drive to draw works is 1¼-in. pitch quadruple-width roller chains. Lubrication is by two force feed oil pumps, each driven by individual engine extended shaft. The drive case is electrically welded plate steel, forming a dust-proof, oil-tight case.

Single Pump Drive

When a single pump is used, with two engines, the pump is driven by V-belts from 14-in. pitch diameter 14 groove "D" section pulley on extended shaft of dual engine drive. When the third engine is used, its power is transmitted to the dual engine drive through this V-belt pulley and shaft, and the pump is driven by a similar V-belt pulley direct from the third engine drive shaft.

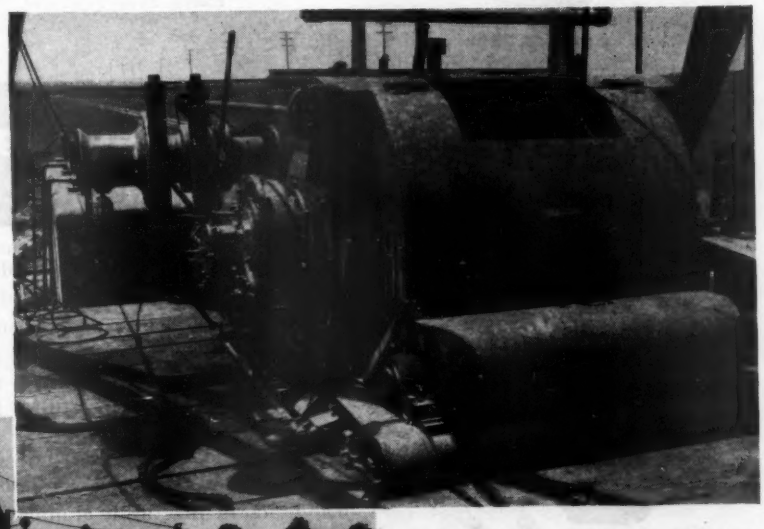
Two-Pump Drive

Drive for two-pump installation on two-engine rig is by use of a countershaft placed immediately behind the dual engine drive. The center drive on the countershaft is V belted to the dual engine drive and pumps driven from outside V-belt sheaves. The drilling pump is controlled by friction clutch and standby pump by jaw clutch. When the third engine is used, it ties into the dual engine drive through the usual pump drive, the pumps being driven from the main shaft of the third engine.

Substructure

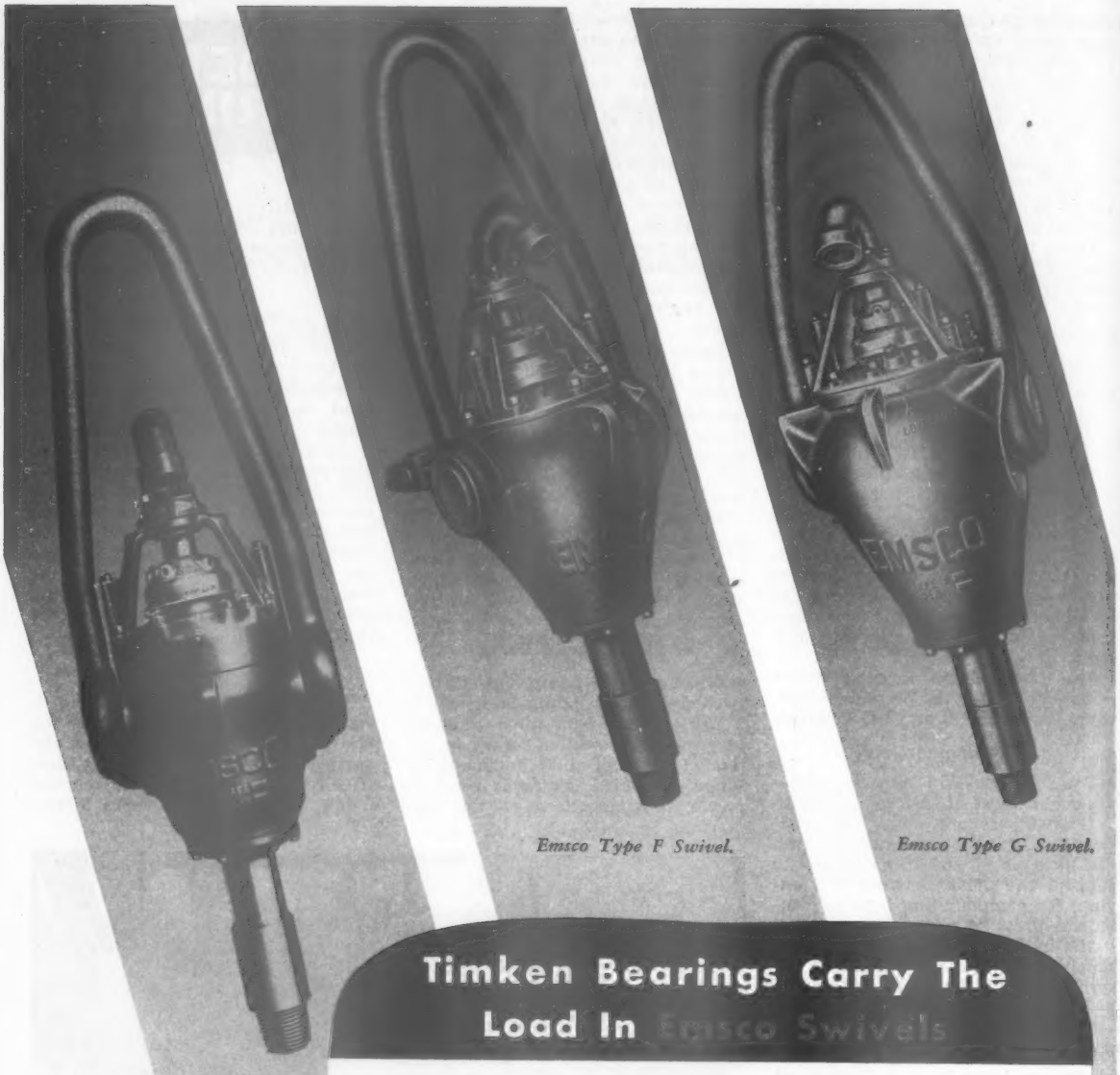
The substructure for the rig is constructed of 10-in. H beams top and lower section, with all cross and vertical members and bracing electrically welded, providing correct height to allow draw works to rest on derrick floor and with sufficient length to support the engines and compounding drive.

Foundation under draw works is derrick-floor height. Foundation under engines and compounding drive can be furnished at any desired height to provide ease of unloading and loading these items, and to furnish greater efficiency of pump drives.



Right: Draw works on derrick floor with engines on lower level in background. Notice convenient location of all controls in driller's position. Complete enclosure of all drives is important safety feature

Below: View from mud pits showing the compact in-line engine assembly. V-belt drive to pump from third engine shaft



Emsco Type AE-6 Swivel.

Emsco Type F Swivel.

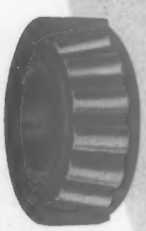
Emsco Type G Swivel.

Timken Bearings Carry The Load In Emsco Swivels

The main bearings in Emsco Model AE-6, F, G and H Swivels are Timken Tapered Roller Flat Thrust Bearings. These are the bearings that dependably sustain the weight of the drill pipe strings with a safe margin of overload. These are the bearings that keep the swivels turning easily and smoothly under all drilling loads and shocks.

Timken Main Swivel Bearings, furthermore, relieve the rotary of unnecessary swivel resistance; reduce power demand; and by practically eliminating wear at this vital point greatly reduce maintenance and extend swivel life.

No matter how good an oil well swivel may be, it will be a *still better* swivel if it is Timken Bearing Equipped. Keep this in mind when buying. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Metal Scarcity Passes

FINAL issue (No. 14) of the Material Substitutions and Supply List of the Conservation Division of the War Production Board, dated October 1, 1944, discloses that only tin, cadmium, chromium, sodium, ferro-nickel, and monel metal are not available in sufficient amounts for both war and civilian purposes. Of these only tin is expected to remain on the critical list after hostilities with Germany are terminated. Nevertheless, the supply of the following fabricated and semi-fabricated metal products is still troublesome due to shortages in either manpower or in manufacturing facilities, or both:

Malleable iron castings.

Small and medium size steel castings.

Automotive type gray iron castings.

Wire rope and rope wire.

Copper and copper-base tubing over 4 in.

Copper wire, cable and cords (insulated).

Tungsten rod, wire and sheet.

Molybdenum rod, wire and sheet.

Metallic materials that are available as substitutes for more scarce materials are:

Group III—A. Metals

(a) Miscellaneous: Aluminum, antimony, calcium, gold, magnesium, mercury, palladium, tantalum (new comer), zinc (new comer).

(b) Ferro alloys: Ferroboron, ferrochromium (high carbon), ferromanganese, ferrosilicon, ferrotitanium, ferrotungsten, ferrovanadium, molybdenum, silicomanganese, silivery iron, zirconium ferro alloys.

(c) Ferrous: Gray iron castings (except Group I items), pig iron, reinforcing (all types), rerolled rail. Steel: Castings (except Group I items), forgings (except drop and upset).

The steady decrease in metal shortages since April 15, 1943, to date, may be viewed with pride by every American. Even the future is approached with confidence in issue No. 14 which states:

"A German collapse may or may not come quickly. When it arrives large cutbacks should change favorably the materials situation as recorded in this issue. (But) . . . it has been possible to determine that certain materials probably will continue short for some time after V-E Day regardless of military cutbacks. Such materials in this issue will carry a star (*)... The only metal so listed in issue No. 14 is tin.

The figure or tabulation on this page shows the progress in procuring adequate supplies of metals. No. I indicates shortage metals, No. III indicates substitute metals, and the No. II classification (insufficient for all civilian needs) is not shown because it confuses the tabulation. Metals, the supply of which has never been critically scarce, are not shown. Note that magnesium was the first important metal to escape from the critical list and that it became a substitute metal by July 15, 1944. Among important metals that became available for limited civilian use in October of last year were zinc, aluminum, molybdenum, tungsten, vanadium and chromium ferro alloys, and many of these have since become available in such quantity that they can be used as substitutes for other less-abundant metals. Although some steel products have been short at all times, only during October, November and December of 1943 was steel put on the controlled metal list.

SHORTAGES OF METALS—CRITICALLY SHORT, MARKED I—AVAILABLE FOR SUBSTITUTION, MARKED III

	1943			1944			
	Apr. 15	July 15	Oct. 1	Jan. 15	Apr. 15	July 15	Oct. 1
Tin	I	I	I	I	I	I	I
Cadmium	I	I	I	I	I	I	I
Nickel (ferro) and monel metal	I	I	I	I	I	I	I
Chromium	..	..	..	..	..	I	I
Sodium	..	..	..	I	I	I	I
Columbium (ferro)	I	I	I	I	I	I	..
Bismuth	I	I	I	I	..	..	..
Platinum	..	..	I	I	..	..	..
Tantalum and ferrotantalum	I	I	I	I	..	..	III
Copper	I	I	I	..	..	..	..
Steel	(*)	(*)	I	(*)	(*)	(*)	(*)
Beryllium	I	I	I	..	..	..	..
Lithium	I	I	..	..	..	..	..
Iridium	I	I	..	..	..	..	..
Osmium	I	I	..	..	..	..	..
Silicon metal	I	I	..	..	..	..	..
Zinc	I	I	..	..	..	..	III
Aluminum	I	I	..	..	..	III	III
Molybdenum (ferro)	I	I	..	III	III	III	III
Tungsten (ferro)	I	I	..	..	III	III	III
Vanadium (ferro)	I	I	..	III	III	III	III
Chromium (ferro)	I	I	..	III	III	..	..
Magnesium	I	..	..	..	..	III	III
Rhodium	I	..	..	..	..	..	..
Calcium	I	..	III	III	III	III	III

*Some steel products have been critical at all times. Small and medium castings are short now.

Salvage of Pump Shafts And Other Items

MANY special metal parts that have served without replacement are now wearing thin; a real shortage of special metals may now be on the way. Examples of the salvage of pump shafts, tie rods, eye bars, etc., by various industries have been reported and it would seem that similar salvages are possible in the petroleum industry.

In the steel industry, discarded monel metal tie rods from a pickling tank were cut down and machined into spray nozzles for handling water that was corrosive and was laden with particles that caused erosion. A common practice, particularly in the chemical industry, is to cut valve stems, bolts and other fastenings from discarded pumps. Pump shafts for handling corrosive liquids in the manufacture of pulp and paper have been machined down to sizes suitable for smaller pumps and also into valve stems, bolts, spacers, washers and nuts.

Many common but now scarce metals such as monel, inconel, nickel, stainless steel, and chromium nickel alloys are so valuable that financial savings as well as material salvage can be accomplished.

Emergency Specifications Revoked

WAR PRODUCTION BOARD announces via Gen. Bulletin G-20 that Directives No. 8 and No. 9 are revoked as of October 4, 1944. Directive No. 8 covered the Design, Fabrication and Erection of Structural Steel for Buildings, and Directive No. 9 covers Design of Reinforced Concrete Buildings.

This action rescinds the two National Emergency Specifications and reverts to prewar status the allowable working stresses used by architects and engineers—i.e., to the locally applicable building codes or other standards.

Design Features of Compressor Stations On Tennessee Natural-Gas Line

by Harold F. Dawe* and Henry N. Wade†

This is the second part of an article on the compressor stations and dehydration plant of the new Tennessee line. In the first part, published in last week's issue, the authors discussed the spacing of the stations, how the compressors were selected, ignition, and other factors. In this article the discussion is continued, particularly as related to the design features of the stations. The third and final installment, which will describe the dehydration plant, will appear in an early issue.

THE compressor units of the Tennessee Gas & Transmission Co. pipe line are interconnected by means of a continuous walkway having steps down to the compressor-room floor at alternate engines. Full basement ventilation has been provided and advantage has been taken of the basement windows to use them as safety escapes by installing access ladder rungs in the basement walls.

There are two uninsulated silencers per engine and each silencer exhaust line has a metal jacket which serves to carry heat radiated from the exhaust pipe to the outside of the building. A vent stack on this jacket is provided with a damper to enable the amount of hot air vented to be controlled. This materially reduces the building heating load in cold weather.

Air cleaners have been provided and installed on an 18-in. air-intake line to all compressors. These units are provided with 16-in. backfire-relief valves to prevent damage in case of backfire.

Stairways afford access to the basement at either end of all compressor buildings, and a central escape hatch to the compressor floor midway in the buildings affords an additional emergency exit from the basement.

Advantage is taken of the basement to house a jacket-water dump tank, the oil-reclaimer units, dirty and clean-oil tanks, and drainage-sump pumps. The jacket-water dump tank serves as a container to collect jacket water drained from the engines when down for repair. Such a tank is necessary to avoid waste of expensive treated water on a closed system. The tanks are connected to enable the operator to blow, by means of air, the drained water back into the main surge tanks. These tanks are protected from overpressure.

Oil system. — Two oil reclaimer units are installed in the basement at each station. These units are so arranged that the oil from any engine may be treated and returned to that engine.

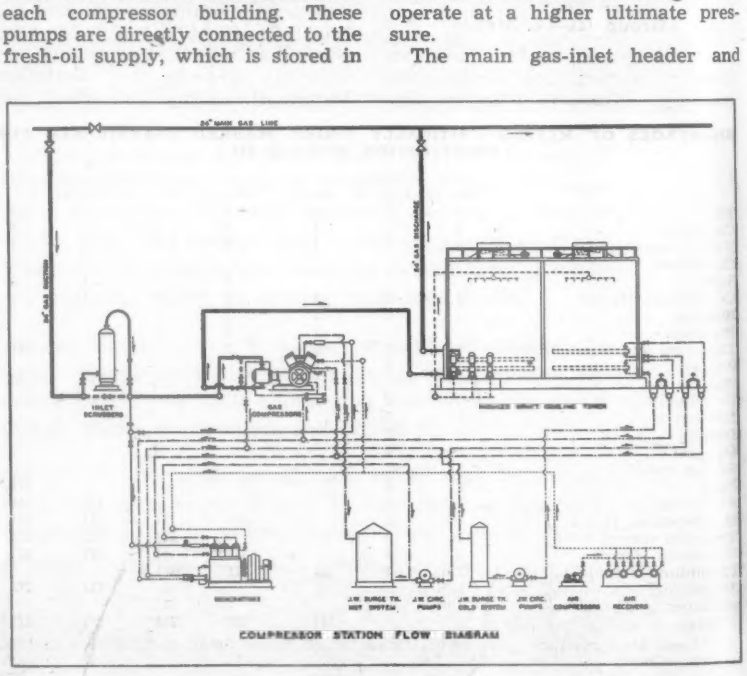
An oil-drain header is installed in the basement and connected to the compressor rod packing gland housings. This header is also connected through valves to the crankcase of each engine. The compressor-rod oil drips enter this line and flow to a dirty-oil tank; also, when an engine is taken off the line for maintenance the oil may be drained to the dirty-oil tank. The oil-reclaimer units receive oil from the dirty-oil tank and deliver the reclaimed oil to the clean-oil tank. A manually operated dispenser pump is placed on the compressor floor, and takes suction from the clean-oil tank.

Two additional lube-oil-dispenser units with counters are installed in each compressor building. These pumps are directly connected to the fresh-oil supply, which is stored in horizontal 10 by 20-ft. main lube-oil-storage tank installed near the building.

There is a drain pan in the compressor floor directly connecting into the dirty-oil tank, and another connecting into the clean or reclaimed oil tank. In case polluted oil must be disposed of, it may be poured down into the dirty-oil tank, and clean oil may be returned to the reclaimed or clean-oil tank through these drain pans. This lubricating system provides for flexibility in handling lube oil and with a minimum of waste.

Gas cooling. — The 24-in. gas-discharge header runs to the cooling tower, where the gas enters into atmospheric-cooling sections. These sections have been selected to obtain a low-pressure drop, both at present and in the ultimate design. They are provided with 8-in. inlet and outlet nozzles and each bank is individually valved. The sections are connected in parallel banks of two sections each, in series, with an upward flow. In all stations, except No. 14, 800-lb. single-pass sections are used. In case of Station 14, 1,000-lb. single-pass sections are used as this station is designed to operate at a higher ultimate pressure.

The main gas-inlet header and



*Stearns-Roger Manufacturing Co. †Parkhill-Wade.

each lead to and from the coils is provided with an industrial thermometer. The gas flows from the cooling sections into a 24-in. outlet header and thence directly to the main pipe line.

Cooling towers.—The cooling towers are the induced-draft type and are all identical.

The spray-water requirements for Stations 2, 4 and 6 are 8,000 g.p.m. each; for Stations 8, 10 and 12, 8,960 g.p.m. each, and for Station 14, 9,450 g.p.m. The design temperature of basin water for towers 2, 4, 6 and 14 is 93° F., and for towers 8, 10 and 12, 92° F. The water is cooled to 80° in these towers with 75° F. atmospheric wet-bulb, except No. 14, which cools the water to 81° with 75° wet-bulb.

Three pumps have been installed per tower for recirculating the spray water. They are vertical, single-stage, turbine-type pumps, electric-motor driven. In Stations 2, 4, and 6, each of these pumps handles 4,000 g.p.m.; in Stations 8, 10, and 12, 4,500 g.p.m. each; and in Station 14, 4,750 g.p.m. each.

The pumps are mounted at one end of the tower, over a sump which communicates through double screens with the basin proper. Each pump discharges through an 18-in. check and gate valve into a 24-in. header line. Water is taken over the tower through three 16-in. lines. Each of these lines has orifice flanges and plate installed in order that the water may be metered.

Cooling water is made up to the tower through a 4-in. line. After much discussion, makeup-water valves were discarded and 4-in. meter runs were installed. An indicating flow meter is installed to control the water flow to the tower. This provides an accurate method of maintaining control over makeup and assures a constant wastage, thus controlling the basin concentration of salts.

Cooling-water system. — In selecting the proper cooling system, the principal objective was to attain a cooling system which would permit of not more than 10° F. temperature rise through the power-cylinder jackets, and with a minimum power consumption. All manufacturers contacted agreed that a 10° F. rise through the jackets of the engines was very desirable for best engine performance.

The system chosen and installed calls for two separate cooling-water systems:

The "hot" circulating circuit circulates water through compressor-engine cylinder jackets and electric-generator-engine-cylinder jackets in parallel, and thence, through cooling sections mounted in the cooling tower. The entering water is at 140° F. and the temperature rise is 10° F. The water is circulated at Stations 2, 4, and 6 by means of two electric-motor-driven, horizontal, single-stage, centrifugal pumps, having a capacity each of 3,600 g.p.m. of water. A 10 by 20-ft. vertical surge tank is provided on the suction of the pumps. Two units are required for normal operation, and a third unit is provided for a spare.

Since Stations 8, 10, 12, and 14 have been calculated to handle a total future installation of nine engines, the same size of cooling water pumps have been installed as in the other stations.

As two of these units run continuously, no emergency control has been provided on these pumps. If one pump should shut down, the second pump would maintain sufficient circulation to prevent damage until the spare pump could be started, or the compressors and generators shut down. A pressure switch is installed on the pump discharge which sounds a warning signal on low pressure or pressure failure, to warn the operator.

The pumps force the jacket water through a 24-in. header to the cooling tower, where it flows upward through six parallel banks of two atmospheric cooling sections in all stations, except No. 14, which has five. These coils have 8-in. inlet and outlet nozzles, and require a 6-lb. pressure drop. Industrial thermometer wells are installed in each inlet and outlet line.

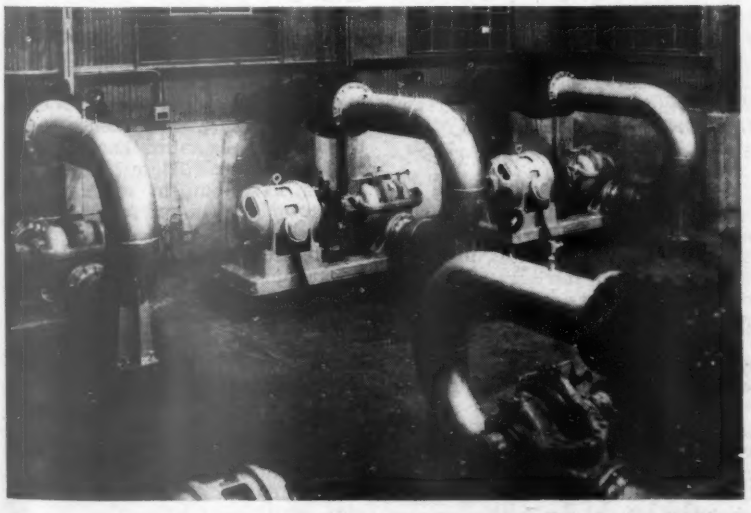
To control the cooling-water temperature, a temperature-controlled bypass valve is connected across the inlet and outlet water headers. The outlet-water temperature from the engines is controlled.

In the secondary or "cold" circulating circuit, the water passes through the oil coolers and the compressor cylinders in series. The water from the compressor cylinders flows to a 4-ft. diameter by 20-ft.-high surge and vent tank connected in the circuit and merges with the water from the generator oil coolers at the suction of the recirculating pumps. The pumps discharge the water through a 14-in. header to the cooling tower, and through six parallel cooling banks each consisting of two sections in series at Stations 2, 4, 6, and 14, and seven parallel cooling banks each consisting of two sections in Stations 8, 10, and 12.

Water circulation in the "cold" circuit is maintained at Stations 2, 4, and 6 by use of an electric-motor-driven, horizontal, double-suction, single-stage, centrifugal pump, having a capacity of 1,335 g.p.m. At Stations 8, 10, 12, and 14 this pump is rated 1,850 g.p.m. Spares are provided for all pumps.

In this system, one pump runs continuously, and one pump acts as spare. No automatic starting system for the spare pump has been installed, since a failure of cooling in this system will do no damage. To control the temperature in this "cold" circuit, a temperature-controlled bypass valve is connected across the inlet and outlet headers to the cooling sections.

All water in the cooling systems is treated for corrosion control and to reduce scale-forming tendencies. The cooling tower basin and piping alone contain approximately 175,000 gal. of water; the "hot" circuit contains about 45,000 gal. of water, and the "cold" circuit about 15,000 gal. Before initial operation of these systems each was given an initial charge of the best possible cooling water. It is planned to make daily checks on all water to insure complete water control, which control will be directly reflected in reduced maintenance costs and increased pumping capacities through the



Electric centrifugal pumps and piping at auxiliary building of Batesville, Miss., compressor station

maintenance of high heat-transfer coefficients.

Electric-power system. — Electric power for each compressor station is generated by three gas-engine-driven generators. In Stations 2, 4, and 6, the 4-cycle gas-engine drives are rated 400 hp. at 450 r.p.m., and in Stations 8, 10, 12, and 14 the units are rated 370 hp. at 400 r.p.m.

The generators of all units are of the standard open-frame engine type, rated 312 kva., 250 kw., 480 volt, 3 phase, 60 cycles, with a 40° C. rise. The generators are equipped with 7½-kw., 125-volt, 1,750-r.p.m., V-belt connected exciters.

Power Distribution

The generators feed electric energy directly to a buss system contained in a unitized totally enclosed control center. From the center, electric power is distributed to all parts of the station.

Breakers are provided for engine ignition rectifiers, sump pumps, heater motors, circulating water pumps, air compressors, elevated water tower pumps, cooling tower fans and recirculating water pumps, well pumps and plant lights. Spare circuits are provided, as well as a P. F. meter, indicating watt meter and totalizing and indicating kilowatt-hour meter.

The generator units are housed with the cooling-system pumps and starting-air compressors in a steel frame, galvanized iron covered building, 40 ft. wide by 78 ft. in length. A full bridge-type craneway is provided for convenience in overhauling generators and pumps. The pumps are located in a 3-ft.-deep pit at one end of the building and are reached by stairs.

In all stations the starting-air units consist of one electric-driven air compressor and one combination electric-motor and gasoline-engine drive air compressor. All air compressors have a 40-cu. ft. air-per-minute capacity so that each station has a total capacity of 80 cu. ft. per minute. These compressors discharge into four 30-in. by 15-ft. air receivers, designed to operate at 250 lb. The air tanks have pressure gages and relief valves.

A small oil-reclaimer unit is installed in each generator building, and operates on the three engines. A dirty oil tank is provided to allow crankcase oil from any engine to be drained. The reclaimer unit takes oil from this tank, cleans it, and discharges it into a clean or reclaimed-oil tank, provided with a dispenser pump. Oil makeup can be from this tank or from another dispenser pump connected to the 10-ft. by 20-ft. main lube-oil storage tank.

Water supply and storage. — In Stations 2, 4, 6 and 8 two water wells supplying 200 g.p.m. each have been drilled. Electric motor-drive deep-well pumps have been installed. These wells discharge through a check valve into the 2,000-bbl. main water storage tank. Stations 10, 12 and 14 have supply sources from nearby streams and springs. Station 10 has a 10,000-bbl. main reservoir tank, and Station 12 has two earthen reservoirs. These reservoirs, springs, and streams supply water to the 2,000-bbl. water storage tank.

The feed water to the 2,000-bbl. tank is controlled by a level controller with float ball in the tank, operating a 4-in. throttling type diaphragm valve on the feed line. The cooling tower basin water is furnished directly from this tank through a 4-in. line.

Stations 2, 4 and 6 each have an elevated tower tank approximately 40 ft. in height, to supply pressure on the station and camp water systems. Water is supplied to this tank by means of two 80-g.p.m. electrically driven centrifugal pumps, taking suction directly from the 2,000-bbl. tank. These pumps are controlled by a hydrostatically operated electric relay which operates when the tower water level reaches a predetermined low point, and shuts off when a high level has been reached. Either one or both pumps may be used, as required. Stations 8, 10, 12 and 14 each have a standpipe 60 ft. high of 24-in. pipe serving as water storage tank. Water is supplied to these by small electric motor centrifugal pumps.

Fuel-gas system.—The fuel gas to each station enters a pilot-operated primary fuel-gas regulator where the pressure is reduced from 400 to 200 lb. This regulator opens upon pilot failure. The 200-lb. gas from this regulator enters a secondary pilot-operated fuel-gas regulator where the pressure is reduced to 100 lb. This regulator is duplicated by regulator in parallel; either will handle the full fuel requirements for the compressor station. Each of these regulators will close upon its pilot failure; while the other regulator then takes the full load of the plant.

Pressure Regulator

The primary regulator is spaced a considerable distance from the secondary fuel-gas regulator in order to minimize the refrigerating effect of the gas expansion through each regulator.

The gas from the secondary fuel-gas regulator enters a volume chamber where the flow of gas is smoothed out. The regulator-control pressure line taps into this volume chamber, the reserve volume of gas preventing regulator "hunting." A 6-in. pipe line from this volume chamber acts as an orifice meter run. The fuel-gas requirement for the station is metered through this run by means of a standard orifice meter. A recording thermometer is also installed in this run.

The gas leaving the metering run enters into a second volume chamber on the outlet of which is placed a balance pressure-regulating valve. The pressure is reduced from 100 lb. to the compressor-fuel requirements by this regulator, and at the required pressure the gas is then supplied through a 10-in. fuel-gas header to the compressor building, and through a 4-in. line to the generator building.

Power Unit Fuel

The generator fuel-gas regulator is a sensitive-type regulator which drops the pressure from 45 to 1 lb. into a small volume tank which is protected from overpressure through a diaphragm control valve acting as a relief valve. The gas from the regulator volume chamber then enters the 6-in. generator fuel header. Each generator is equipped with a sensitive regulator, reducing pressure from 1 lb. to 3-in. of water. A volume tank is provided between the generator regulator and mixing valve.

The compressors do not have individual regulators, but a large main fuel header is installed and each compressor is provided with a large fuel volume chamber to smooth out surges and provide additional volume.

The primary regulator is installed in a valve box in the plant yard and the secondary and intermediate regulators, volume chambers, and 6-in. meter run, are housed in a separate steel frame, corrugated, galvanized-iron building. The generator-fuel regulators are housed in the auxiliary building. The secondary fuel, intermediate pressure, and generator-fuel regulators are all duplicated as a precaution against shutdowns.

The gas fuel to the office building, pipe-line warehouse, machine shop, and change room building is measured through a displacement meter, and the pressure is reduced at each building by regulators handling the required fuel. These regulating valves have built-in relief valves and automatic shutoff features.

Speed control.—Since Stations 12 and 14 are subject to fluctuating demand, automatic speed control has been installed in these stations. These automatic controls maintain the station pressure as required. The control center of these systems is a two-pen pressure recorder controller. One pen records station suction pressure; the second, or controller pen, is actuated from the discharge header pressure and controls air supply to a diaphragm motor with positioner for resetting the engine-governor spring. A second diaphragm lever motor with positioner

controls the scavenging air bypass and is in turn controlled by the gas manifold pressure. In action the automatic control acts to change the governed speed of the engine, and the amount of scavenged air is changed in proportion. Station 14 controller has an additional pen which records discharge pressure on low pressure system.

In Stations 2, 4, 6, 8 and 10, a two-pen pressure recorder is installed in the compressor room and connected to record station gas discharge and suction pressure. These instruments may be changed later, if desired, to pressure controllers for automatic speed control service by inserting the pressure control elements in the instrument cases.

Building heating. — Provision is made at all stations for heating the warehouse, shop and change room building and pipe-line warehouse by means of individual gas-fired heater units. The offices at Stations 8, 10, 12 and 14 are heated by gas-fired forced air furnaces. The offices at Stations 2, 4 and 6 are heated by individual room type heaters. The compressor building and auxiliary building at Stations 10, 12 and 14 are heated by means of 15-lb. steam. The steam is generated in a gas-fired boiler located in the auxiliary building. Steam is piped to the compressor building through an underground conduit and thence to individual heating units.

Boiler Installation

The remainder of the buildings at these stations are not heated and on account of their geographical location, no provision is made for heat at Stations 2, 4 and 6 for any building other than the ones which have been mentioned previously.

Provision is made in the auxiliary building at Station 8 for the installation of a future boiler.

All boilers are served by condensate return units. These units have their own makeup control, return tank for controlling makeup water and charging pump for boiler feed water. These units are mounted in the auxiliary building adjacent to the boiler.

The boilers are equipped with 20-in. by 25-ft. self-supporting steel stacks.

At each station a 20-gal. automatic hot-water heater is installed in the office and a similar heater of 30-gal. capacity is installed in the change room. These units will provide required hot water for lavatories and showers.

Maintenance facilities.—The maintenance building, which contains the shop, warehouse, and change room building, is 30 ft. wide and 60 ft. long. The central section of this building, 30 ft. by 30 ft., is given over to warehouse space; bins are built along the walls and a small closed space is provided for housing electrical material. One end of this building, 12 by 30 ft., is given over to a change room for employe use. This change room is fully partitioned off and is provided with adequate locker space, a wash fountain, a shower stall, and sanitary facilities.

The remaining space in the building, 18 by 30 ft., is used for a maintenance shop. This section is provided with a monorail and hoist. In Stations 2, 4, 8, 10 and 12 this shop is equipped with lathe, drill press, arbor press, grinder, welding equipment, and necessary tools to handle all but major repair work. The other station shops do not have machine equipment since they are located within easy range of large mechanical job shops. All station shops, however, can handle all minor repair work since they are equipped with the necessary hand tools.

The diameter of dust scrubbers through which inlet gas enters compressor stations is 54 in. This is mentioned as a correction of a scrubber diameter dimension of 5 ft. in the section on dust scrubbers in the first installment of this article on page 102 of the November 4 issue.

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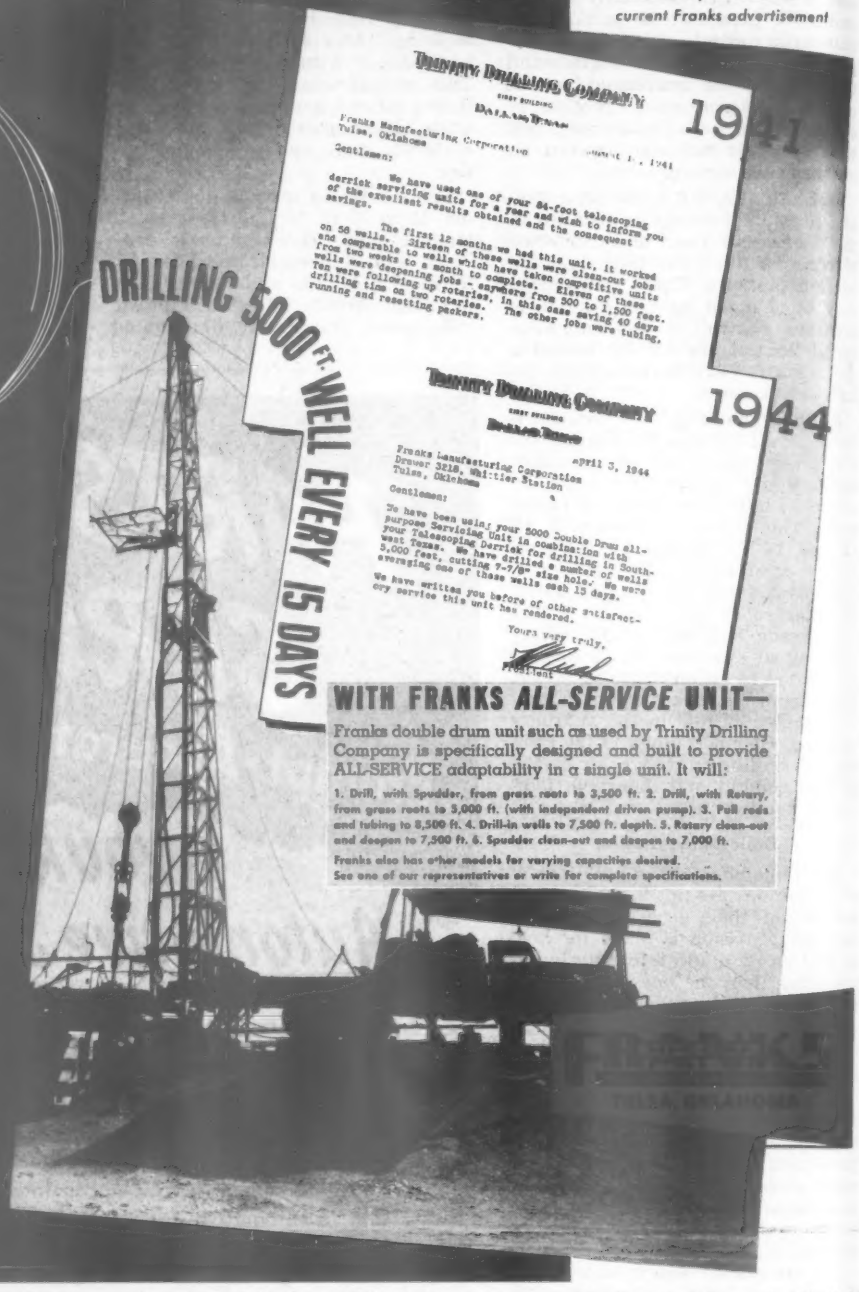
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We have used one of your 84-foot telescoping derrick servicing units for a year and wish to inform you of the excellent results obtained and the consequent savings.
The first 12 months we had this unit, it worked on 56 wells. Thirteen of these wells were clean-out jobs and comparable to wells which have taken competitive units from two weeks to a month to complete. Eleven of these wells were deepening jobs - anywhere from 500 to 1,500 feet. Ten were following up rotaries. In this case saving 40 days drilling time on two rotaries. The other jobs were tubing, running and resetting packers.
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April 3, 1944
Franks Manufacturing Corporation
Drawer 3218, Whittier Station
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Yours very truly,
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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

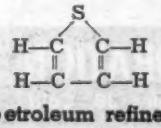
Sulfur in Oils

DIFFICULTIES with oils which contain sulfur compounds arise in only three main ways—corrosion, odor, and poor explosion characteristics of gasoline fuels. Corrosion by finished products presents little difficulty because most products are used at low temperatures, temperatures at which only such compounds as hydrogen sulfide, free sulfur and some of the lowest boiling sulfides, disulfides and perhaps mercaptans are corrosive toward the main commercial metals. These low-boiling materials tend to be concentrated into the gasoline by distillation and hence inherent corrosiveness is seldom encountered in higher-boiling products except occasionally in kerosene. Thus, the main bulk of the corrosive sulfur compound can be removed by treatment with alkalies or the "sweetening" treatments. In the presence of air and moisture, the sulfur gases produced during the burning of oils may cause corrosion, as in steel stacks, ducts, and engine exhaust pipes or mufflers. Corrosive or unstable sulfur derivatives of the sulfuric acid used in treating oils, such as alkyl sulfates and sulfonic acids, may also be present but these can usually be eliminated by better plant control of treating. Real difficulties arise when high-sulfur oils are heated to temperatures of 300° F. or higher for copper or 400° F. for steels. This may be illustrated by dibenzyl disulfide, a common gear-lube additive, which is noncorrosive to copper at 212° F. but is corrosive at 300° F.—must be corrosive if the lubricant is to function properly. Corrosion in gathering lines and refineries, particularly at high temperatures, is of vital importance but this complicated problem will be handled in No. 22 of this series.

Odor is most obnoxious with low-boiling or gaseous sulfur compounds, as hydrogen sulfide, sulful dioxide in flue gases, mercaptans up to even 6 carbon atoms (b.p. of about 400° F.), sulfides up to 8 carbon atoms (about 350° F.), and among disulfides only methyl disulfide (b.p. 243° F.). Thus odor is not obnoxious except in sweetened products except certain extremely high-sulfur gasolines.

Susceptibility or responsiveness of gasolines to tetraethyl lead is greatly harmed by small amounts of sulfur compounds but unfortunately the exact effect of each sulfur compound is not known. In a general way the sulfides are less harmful than disulfides. The reduction of sulfur in gasoline down to under 0.01 per cent usually increases the octane number (with 3 cc. of tetraethyl lead) by two or three points as compared with the undesulfurized gasoline, but may be almost ineffective on some gasolines and is occasionally much more effective.

STRUCTURAL FORMULAS OF SULFUR COMPOUNDS—R REFERS TO ANY ALIPHATIC OR AROMATIC GROUP

Hydrogen sulfide	H—S—H
Mercaptans:	H—S—R
Methyl	H—S—CH_3
Benzyl	H—S—C_6H_5
Sulfides:	R—S—R
Methyl	CH_3—S—CH_3
n-Butyl	C_4H_9—S—C_4H_9
Disulfides:	R—S—S—R
Methyl	CH_3—S—S—CH_3
Cyclic sulfides	$S<\begin{matrix}CH_2\\|\\(CH_2)n\end{matrix}$
Alkyl sulfates	$R—O—\overset{O}{\overset{\|}{S}}(=O)—O—R$
Sulfonic acids	$R—\overset{O}{\overset{\|}{S}}(=O)—O—H$
Sulfoxides	R—S(=O)—R
Sulfones	$R—\overset{O}{\overset{\|}{S}}(=O)—R$
Thiophene	

Historically sour or sulfur-bearing crude oils have been shunned until refiners learned to handle them, e.g. Lima, Ohio; Eldorado, Kans.; naphthenic oils of Texas and California; and most recently West Texas and the black oils of Wyoming. The average sulfur content of crude oils has generally increased until in 1936 the average was (1) paraffin base 0.38 per cent, (2) mixed base 0.49 per cent, and (3) naphthene base 1.09 per cent. The averages are greatly affected by a few high-sulfur crude oils, such as:

	Per cent sulfur
Paraffin base:	
Pecos County, Tex.	1.53
Van, Tex.	0.86
Mixed base:	
Ventura Avenue, Calif.	1.16
Seal Beach, Calif.	1.23
Coyote, Calif.	1.46
Huntington Beach, Calif.	1.42
Torrance, Calif.	1.62
Dominguez, Calif.	1.76
Playa del Rey, Calif.	2.60
Grand Falls, Tex.	1.50
Chalk-Settles, Tex.	2.01
Luling, Tex.	0.92
Hobbs, N. Mex.	1.48
Eunice, N. Mex.	1.37
Sunburst, Mont.	1.47
Naphthene base:	
Kern River, Calif.	1.07
Midway-Sunset, Calif.	1.00
Fullerton, Calif.	1.43
Montebello, Calif.	0.85
Richfield, Calif.	1.09
Inglewood, Calif.	2.59
Hendrick, Tex.	1.52
Smackover, Ark.	2.40

These high-sulfur oils constitute about 18 per cent of the paraffin-base production, 16 per cent of the mixed base, and 65 per cent of the naphthene base.

The sulfur content of lubricating oils and fuel oils is of little significance but with gasoline it causes:

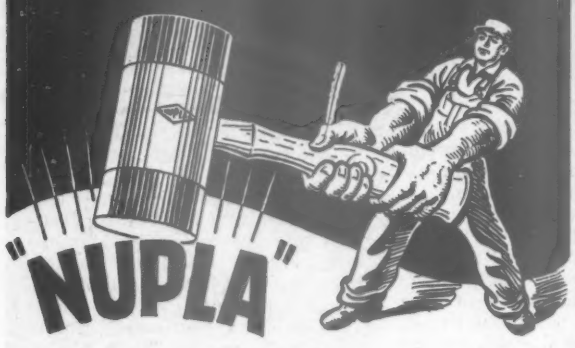
1. Lower octane number.
2. Lower TEL response.
3. Corrosiveness and bad odor.
4. Less good color and gum stability.

And with kerosene it causes:

1. Bad odor and corrosiveness.
2. Smoke and wick deposits.
3. Poor color stability.

No. 17 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

NON-SPARK
MAR-FREE



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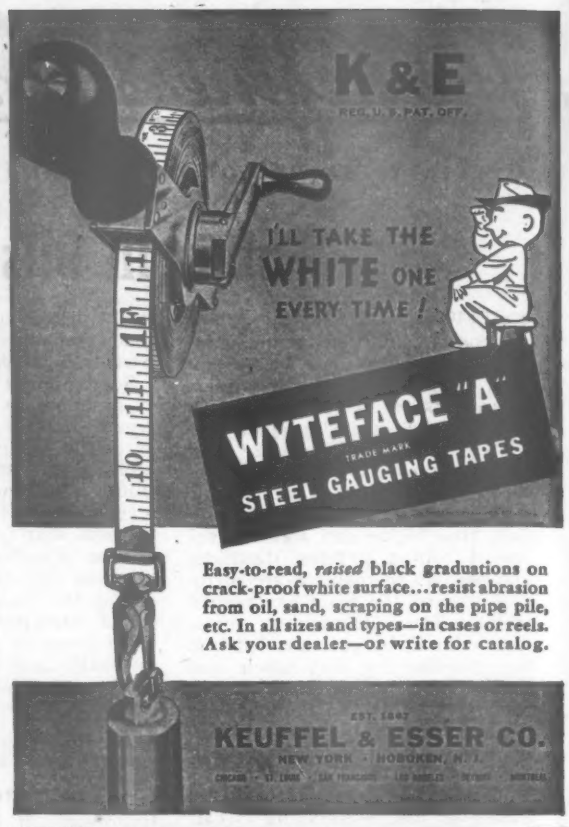

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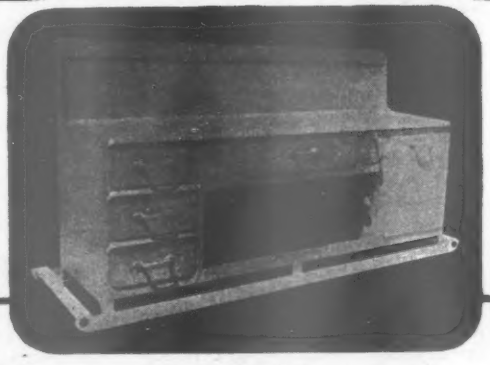

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Engineering Fundamentals

No. 159

A FEATURE OF THE OIL AND GAS JOURNAL

Effect of Sandstone and Oolitic Reservoir Rocks on Production of Oil

OIL accumulates in a structure in any kind of rock that is in contact with or connected through open channels with petroliferous source beds and that offers the necessary continuous pore space through which the hydrocarbons which make up oil migrate. Rocks which satisfy these requirements are, for the most part, of five kinds: (1) quartz sands; (2) oolite limestone; (3) limestone containing multitudinous solution voids and other cavities connected by open cracks and joints; (4) intricately cracked and jointed, more or less dense, siliceous limestones and cherts; (5) rarely, porous altered igneous rocks in which the pores were originally minute gas or steam cavities.

Quartz sands. — The grains of quartz sands in a majority of places have sizes averaging from 0.074 to 0.147 mm. The sizes of the pore interspaces range approximately between 0.007 and 0.02 mm. (7 to 20 microns, and the porosity ranges from about 8 per cent in consolidated sands to about 33 per cent in unconsolidated ones. The permeability, however, varies all the way from zero in consolidated sands to 3,000 millidarcys or more in unconsolidated loose sands. The variation in the porosity depends upon the size of the grains, the uniformity of the grains, and the amount of cementing material between the grains. If there are many fine silt or fine ashy particles between the grains, both the porosity and permeability will be low. If the grains are firmly cemented together, the porosity and permeability will be low. An experienced petroleum engineer can tell by looking at a thin section or fragment of an oil sand under a microscope much about the amount of oil in the sand, the rate of flow of fluids through it, and proper way to screen and finish an oil well in it. The principal oil and water sands have a restricted composition and uniformity of grain size that is quite remarkable. Honess found that out of 16 different oil sands examined, the average diameter of the largest grains was 0.2 mm. and that of the smallest grains was between 0.05 mm. and 0.033 mm. The variation of the average maximum diameter, with one exception, did not exceed 0.11 mm. The uniformity of sand grains is determined by dividing the average diameter of the largest grains by the corresponding average diameter of the smallest grains. In Bradford sand, for example, the uniformity value, according to Honess, is 5.75 mm. This means that the mean of the largest grains of the sand does not exceed the mean of the smallest grains by more than 5.75 mm. Nonoil sands generally have higher uniformity values than the highly productive oil sands which are distinguished by low uniformity values. Engineers have set up an arbitrary factor known as uniformity coefficient which is used to describe the texture of oil sands. The sand is put through a standard series of sieves, and the percentages by weight of sand plotted against the different grain sizes on semilogarithm paper. This graph is known as a cumulative frequency curve (Fig. 1). Then the quotient of the grain size at 40 per cent divided by that at 90 per cent gives a factor known as the the uniformity coefficient. It has been found that, in general, the lower the uniformity coefficient, the greater the porosity of a quartz sand. Screen analysis, porosities, and permeability characteristics of well-known sands are given in the table.

POROSITY, PERMEABILITY, AND GRAIN SIZE OF TYPICAL MID-CONTINENT OIL SANDS

	Average porosity	Average permeability in millidarcys	Average range in size
Woodbine sand, East Texas	29.8[1]	3,155.0[1]	0.149-0.420[1]
Anahuac field, South Texas	31.8[1]	807.0[1]	0.074-0.250[2]
Tomball field, South Texas	34.0[1]	1,110.0[1]	0.074-0.250[2]
Oligocene, Discorbis zone, Gulf Coast	17.8[2]	2,618.0[2]	0.074-0.890[2]
Oligocene, Heterostegina zone, Gulf Coast	12.7[2]	567.6[2]	0.074-0.890[2]
Oligocene, Frio horizon, Gulf Coast	19.6[2]	1,355.0	0.074-0.980[2]
Miocene, Marginulina zone, Gulf Coast	16.3[2]	1,214.5	0.074-0.589[2]
Bartlesville sand, Oklahoma	20.8	7.0	0.125-0.250
Wilcox sand, Oklahoma City	19.2	767.0	.....
Kinter sand, Oklahoma City	11.8	374.0	.....
Bradford sand, Pennsylvania	9.8	4.5-9.0[5]	0.041-0.200[4]

1. Schilthuis; 2. Halbouty; 3. Newcomb; 4. Honess; 5. Fettke.

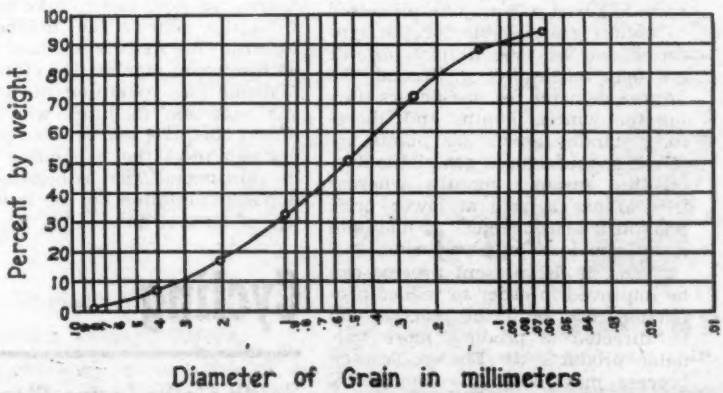

Fig. 1: Accumulative size analysis curve drawn on semilog paper showing method of analyzing the grain size of oil sands. (Diagram by Tickell)

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

Natural Gas

Fischer-Tropsch Paper Features Meeting

CHICAGO.—A paper on "Fischer-Tropsch Synthesis and the Gas Industry" by Dr. V. I. Komarewsky, research professor of chemistry at the Illinois Institute of Technology, and Dr. C. H. Riesz, associate chemist at the Institute of Gas Technology, is to be delivered here by Dr. Komarewsky at the meeting of the Western Society of Engineers on November 13.

"Since the start of World War 2," Dr. Komarewsky will say, "two new developments have been announced, naphthene synthesis and isosynthesis. The second process is of special importance since it implies that high-octane aviation gasoline can be produced. A deficiency of the process up to the present has been the fact that only straight-chain paraffin hydrocarbons are formed from which high-octane gasoline could be produced only by means of additional processes.

"A study of previous work has led to a theory of the mechanism of the reaction. By means of the theory, the choice of catalyst and reaction conditions has been narrowed so that it may become possible to direct the reaction toward the production of desired products, e.g., 100-octane aviation gasoline.

"The interest of the gas industry in the Fischer-Tropsch process is twofold. First, both natural gas and manufactured gas may be processed to obtain gas suitable for the synthesis and as such a new use for gas may be developed. Second, the largest demand for gas occurs during the winter months and, therefore, standby water gas plants are idle in manufactured gas plants during the summer months whereas natural gas is sold at lower price to industrial consumers to maintain a uniform load on pipe-lines.

"Thus, if the present process can be improved in order to reduce production costs or if the reaction can be directed to produce more valuable products the Fischer-Tropsch process may become economically feasible for use in the gas industry. The Institute of Gas Technology has undertaken a program of basic research which includes these objectives."

The Journal published a series of three articles on the Fischer-Tropsch process in the issues of August 19, September 2 and 9.

Natural Gas Group Against Federal Agency Control

Persistent efforts of competing fuel interests to restrict the use of natural gas in favor of coal undoubtedly precipitated the natural-gas investigation recently ordered by the Federal Power Commission, according to the Independent Natural Gas Association of America, in the first issue of a news letter the association has inaugurated.

By the terms of the order FPC will investigate the extent and probable life of natural-gas reserves; measures for preventing waste and prolonging the life of reserves; present and future uses of natural gas; results of competition of natural gas with other fuels, and related matters.

The announced purpose of the investigation is to aid FPC in administering the Natural Gas Act, to develop a public policy with respect to natural gas, and to determine what additional legislation should be recommended to Congress.

The news letter reviews the developments in the Memphis case, and quotes from the trade and news press editorials opposing the effort to place the regulation of the production, gathering, and conservation of natural gas in the hands of a federal agency, and to take it away from the states. The Independent Natural Gas Association had adopted resolutions against the effort, and favoring the extension of natural-gas pipe-line facilities which will afford adequate markets for producers and meet the expanding needs of consumers. The association also opposes limitation on the industrial use of natural gas.

Cycling

South Coles Levee Plant Will Be Started Soon

LOS ANGELES.—Engineering plans are being rapidly completed and actual construction of facilities will begin in the near future on California's second "unit plan" cycling plant at South Coles Levee. The plant will have an absorber operating pressure of 1,500 lb. and capacity of 50,000,000 cu. ft. per day. The Ohio Oil Co. will be the operator.

South Coles Levee field has been well defined and developed. It produces both condensate and black oil.

The operation will be similar to that placed on commercial production previously this year at Paloma where Western Gulf Oil Co. is the operating company.

Natural Gasoline

Thirty Plants or New Additions Being Built

LOS ANGELES.—Construction is proceeding on 30 major natural gasoline and cycle plants or additions to existing facilities, each costing more than $250,000 and aggregating $30,000,000. This over-all picture of construction in the two allied industries was presented here recently by C. E. Webber, chief, natural-gasoline section, Petroleum Administration for War, addressing the annual meeting of the California Natural Gasoline Association.

Webber warned that termination of the European phase of the war would not relieve the urgent demand for natural gasoline and allied products. There has been no thought given to curtailment of alkylation or isomerization operations, he said, because air-force authorities are pressing PAW for improved quality aviation fuel. Only the less desirable base stocks or exceedingly high cost components will be diverted, if a reduction in total volume results from Germany's collapse.

Pessimistic views of the postwar period for natural gasoline operations are not shared by Webber who pointed out that within the past month PAW had authorized additions of ethane-propane towers at cycling plants for recovery of raw materials needed by the chemical industry. He added that other large chemical concerns are seeking concentrated supplies of ethane-propane mixtures and that this trend probably indicates one of the most promising postwar outlets for products of the natural-gasoline and cycling industry.

With the start implemented by the war in combining the talents and resources of the chemical industry and natural gasoline manufacturers, Webber said he could see no reason for reverting to 1940 conditions. Then natural gasoline was a drug on the market.

REFINING

Fuel Oil May Be Again Used for Road Building

WASHINGTON.—Residual fuel oil may be used again for road building and maintenance operations in all parts of the country except the West Coast states.

Action permitting these uses of residual oil was taken by amending Petroleum Administration for War Directive 72, which prohibited the use of road oil as a paving material or dust palliative anywhere in the continental United States. The amendment became effective November 1.

New Plants Approved to Make Hydrofluoric Acid

WASHINGTON. — The War Production Board has authorized construction of new facilities to alleviate a serious shortage of anhydrous hydrofluoric acid.

Anhydrous hydrofluoric acid is used in the manufacture of aviation gasoline and the production of Freon-12 for refrigeration and aerosol bombs, as well as for military applications.

WPB has authorized the General Chemical Co. of New York, to construct a $700,000 plant at Baton Rouge, La., with a capacity to produce 6,000 tons of the acid annually. The Nyotex Chemical Co. of Houston has received authorization to expand its plant at Houston to increase its annual capacity by 3,900 tons. The Houston project will cost $485,000.

Officials reported that production of hydrofluoric acid, by eight plants during the first two quarters of 1944 met requirements fully, but that as military requirements increased appreciably, the producing capacity did not increase proportionately. Production totaled 5,100 tons in the first quarter and 5,700 tons in the second quarter, virtually all of which went to the armed services. When military requirements rose to 7,000 tons for the third quarter, plants were able to produce only 6,400 tons.

WPB officials estimated that upon completion of the new Louisiana and Texas facilities in February 1945 this rate will increase to approximately 9,500 tons per quarter, ample to take care of military and essential needs.

Crude Runs to Refineries Adjusted to War Basis

CHICAGO.—Crude-oil runs to the 126 refineries in District 2 will be readjusted in conformity with an order issued last week by W. W. Vandeveer, district director for Petroleum Administration for War. The order is designed to put refinery operations in gear with recent shifts in war needs for certain oil products.

The total of crude runs for the district will not be affected, nor will the supply of crude be changed.

In general, all refiners in the district are authorized by the order to run a minimum quantity of crude for maximum production of critical war products, or 105 per cent of normal crude runs, depending on which is higher. "Normal" crude runs refers to runs in a specified prior period. Under the new program, runs of a few refiners will be reduced moderately, it is understood.

Air Volume Found to Govern Engine Power

WASHINGTON.—The horsepower of an internal combustion engine is fixed by the amount of air it gets rather than the amount of fuel, according to the results of tests made at the National Bureau of Standards, Department of Commerce, on sub-

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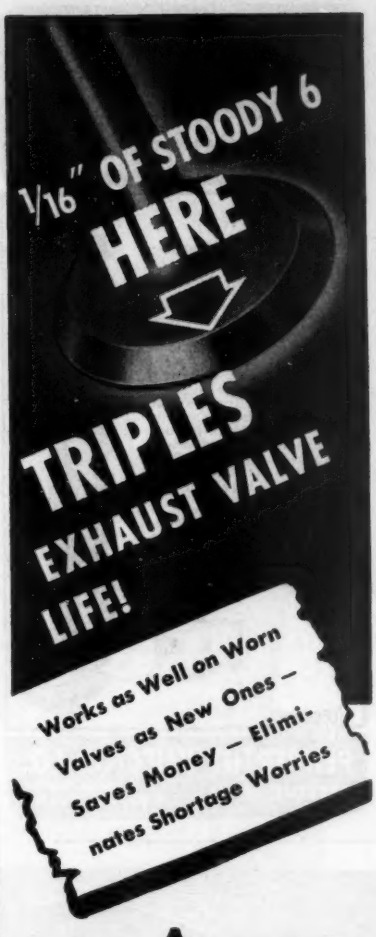
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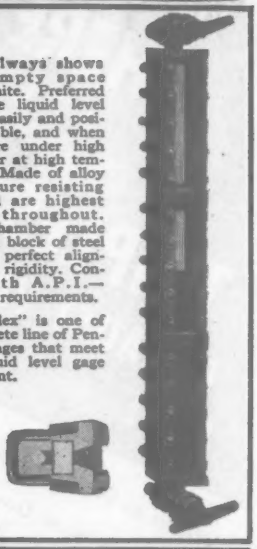

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stitute fuels for possible use in parts of the world where petroleum is not readily available.

In the tests, bureau experts operated engines on alcohol, both conventional grade and in mixtures with water containing as little as 35 per cent alcohol.

With 190-proof alcohol it was found that a given engine develops more horsepower by several per cent than with gasoline, despite the fact that the heat available per pound from the alcohol is less than two-thirds as much as from the gasoline. No consideration was given, of course, to the much higher cost of alcohol. The increased horsepower results from the fact that on vaporizing in the manifold the alcohol cools the air more than does the gasoline, thus permitting a greater weight of air to enter the cylinders. Aromatic petroleum fuels have rapid vaporization characteristics.

Fuel-Oil Sales Volume Outlook Causing Concern

NEW YORK. — Some concern is being felt in local petroleum-marketing circles over the sales-volume outlook for fuel oils during the coming winter.

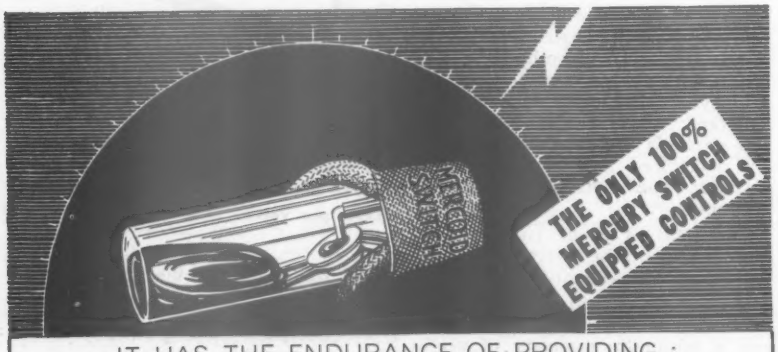
Cancellation of some war contracts for diesel oil previously placed with East Coast refiners has been reported, cutting the expected volume somewhat, and this has not been fully offset by increased civilian allowances, it is claimed. Fears that relaxation of civilian rations will not keep step with the decrease in war sales are behind most of the present uncertainty reflected among marketers.

District 2 Refiners Share Crude With 14 Others

CHICAGO. — Sixteen refiners in District 2 (Middle West) have received directives from Petroleum Administrator for War requiring them to share a total of 19,975 bbl. of crude oil daily with 14 other refiners in the district during November, under the wartime crude-allocation plan. This is an increase over the October allocations both in the number of supplying companies and the volume of crude involved, but a drop in the number of receiving refiners. In October, 12 refiners shared 19,525 bbl. of crude with 17 others daily.

The October number of suppliers and volume of crude involved were the smallest since inception of the plan last year. The totals given do not include any arrangements which may have been made for crude sharing privately between refiners.

The largest supplier for November is Standard Oil Co. (Ohio), which will provide Advance Refining Co. with 1,800 bbl. daily, Stoll Oil & Refining Co. 1,000 bbl. and Pana Refining Co. 375 bbl. Sinclair Oil Co. will provide Worth Refining Co. with 2,600 bbl. daily. Ohio Oil Co., Pure Oil Co., and Shell Oil Co., Inc., will each provide 2,000 bbl. for other refiners.



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Tube Borium Keeps 'em digging

STOODY TUBE BORIUM* KEEPS DITCHER TEETH SHARP ...ELIMINATES FREQUENT SHUT-DOWNS FOR TOOTH CHANGES...CUTS REPLACEMENT COSTS UP TO 75%

The two ditcher teeth pictured above were used on the same machine and operated under identical conditions.
The unprotected tooth at the top had to be sharpened every three days and was too short for further service after six sharpenings.
But the Borium-protected tooth at the bottom operated for 40 days and wore only ½". It was simply resharpened in the forge, retipped with Tube Borium, and put back on the ditcher for another 40 days' service.
Before the tooth was finally worn out, it had operated a total of 120 days!
Tube Borium makes such savings possible because the deposits represent the ultimate in wear resistance and the ability to cut hard earth formations.

*Stoody Tube Borium is supplied in rods of 1/8", 3/16", 1/4" and 3/8" diameters and is available for either oxyacetylene or D.C. electric application. Prices and specifications are yours for the asking.

These tungsten carbide particles do not melt when tube is applied but are held in suspension in a mild steel matrix forming a deposit resembling coarse sandpaper.

Send for free booklet on TUBE BORIUM, showing sizes and styles of rods and recommended methods of application.

STOODY COMPANY
1138 West Slauson Ave., Whittier, Calif.

STOODY HARD-FACING ALLOYS
Stop wear ... Eliminate Repair

PIPE LINES

Freak Breaks Do Not Interrupt Tennessee

Tennessee Gas & Transmission Co. has been delivering 140,000,000 cu. ft. daily at normal pressures during the first week's operation of the new 1,265-mile line. Delivery of gas continued without interruption in spite of certain repairs necessary for the line.

Near South Victoria, Tex., the line was broken by an airplane falling as a result of a freak collision of two airplanes in the air. A gas fire at the break in the line there could be seen for 40 miles. The only other break during the first week of transmitting gas occurred in Tennessee where the line was laid on the side of a steep hill in an area which was difficult to reach by the repair gang.

John W. de Groot Becomes President of Tuscarora

J. W. DE GROOT

John W. de Groot, vice president of Tuscarora Oil Co., Ltd., has been appointed president to succeed John P. Fallon, who has retired. A. F. Aylsworth succeeds de Groot as vice president and will retain his former position as superintendent. The Tuscarora Co., a subsidiary of the Standard Oil Co. of New Jersey, owns and operates the Tuscarora pipe line from Bayway, N. J., to Midland, Pa. The new president and manager of Tuscarora since May 1943 began his company service in 1919 with the general engineering department of Standard Oil Co. (N.J.) at Bayway, following service in World War 1 as an ensign in the Navy. In 1921, he was transferred to the Bayonne refinery where he served as chief engineer for a number of years. In March 1940 he was appointed assistant to the president of Tuscarora, and a short while later became vice president. He was graduated from Brooklyn Polytechnical Institute in 1915.

Aylsworth has been superintendent of Tuscarora since 1940, and has been associated with Standard since 1907, having started with the company in Newfoundland. With the exception of service with the Signal Corps in World War 1, he has been continuously engaged in pipe-line activities, and was formerly head of the inter-refinery pipe-line department at Standard's New Jersey works.

Socony-Vacuum Reconditions New York Products Line

Work has started on reconditioning sections of the 6-in. refined products line paralleling the Erie Canal with laterals to cities in upper New York state. The program is reported to entail the reconditioning of 200 miles of line. Coating and wrapping is being done in connection with the undertaking. The

C. S. FOREMAN COMPANY
General Contractors
PIPE LINES
20 West Ninth Street
Kansas City, Missouri

SYNCHRO-START
HAVE YOU A MANPOWER PROBLEM?
Automatically Controlled Internal Combustion Engines in the field and at pumping and booster stations will lick a lot of your problems, including that of manpower. Ask your Engine Manufacturer or write us for complete information.
SYNCHRO-START PRODUCTS
221 E. CULLERTON ST., CHICAGO, 16, ILL.

AUTOMATIC ENGINE CONTROLS

contractor, O. C. Whitaker Co., is now operating near Weedsport, N. Y. under the supervision of Fred Buers, superintendent.

Plans for $70,000,000 Gas Line Announced

CHICAGO. — Plans for the construction of a $70,000,000 natural-gas pipe line from the Hugoton field of Kansas and Oklahoma to serve cities and towns in Iowa, Illinois, Wisconsin, and Michigan, were announced last week by William G. Woolfolk, president of United Light & Power Co. According to Woolfolk, the project would be undertaken if Securities and Exchange Commission approves a proposal to liquidate and dissolve American Light & Traction Co., United Light & Power subsidiary. In the event of such SEC approval, American Light & Traction's gas-distributing subsidiaries in Detroit, Milwaukee, and Madison would become completely independent and would own and operate the proposed pipe line.

"Organization and building of the new pipe line," Woolfolk said, "is primarily for the purpose of protecting and preserving the operation companies of the American Light system. The company's engineers have worked out plans which would provide for delivery of twice as much gas in 1 day as is now possible from a single line," utilizing extensive underground storage fields already owned in Michigan.

Oklahoma Pipe Line Lays Heidelberg System

Oklahoma Pipe Line Co. has been laying pipe for a gathering system in the Heidelberg pool, Mississippi. An 8-in. line is reported to have been laid to replace a section of a 4-in. line connected with a tank farm. The company has two 5,000-bbl. tanks at the loading rack. Connections have been made with the wells in the Eucutta pool, Wayne County, Mississippi.

Lone Star Gas Co. Enlarges System

Lone Star Gas Co. has commenced construction of lines totaling more than 21 miles, including 15 miles of 8-in. main line; 6½ miles of 4-in. and 6-in. gathering lines and a crossing at the Trinity River in the vicinity of Buffalo and Crockett, Tex., where 8-in. pipe is being laid. The project is scheduled for completion this month. Operations of the contractor, Anderson Brothers, are supervised by Tex Johnson, spread superintendent.

Arkansas River Crossing Laid for Texas-Empire

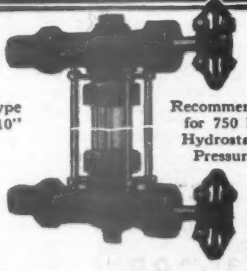
Texas-Empire Pipe Line Co. has started operations in connection with the laying of a 12-in. line across the Arkansas River near Sand Springs, Okla. Laying of the line and dredging have been contracted by Anderson Brothers. Work is supervised by M. D. Gier, spread superintendent.

United Natural Finishes Project in Pennsylvania

In western Pennsylvania, United Natural Gas Co. completed on November 1 the laying of 57 miles of 12-in. pipe for a project to enlarge the capacity of its system in order to handle supplies of gas coming through a series of connections from the recently completed Tennessee Gas & Transmission Co.

Of the 57 miles, 37 miles of the pipe was welded by the pressure weld method. Considerable difficulties were overcome in moving the pressure welding equipment over mountainous country. Welding operations are reported to have been satisfactory. Laboratory tests of welding were conducted under the direction of J. G. Montgomery, Jr., vice president, United Natural Gas Co.

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



Type "10"

Recommended for 750 lb. Hydrostatic Pressure

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

"CLEVELANDS"

An Outstanding Contribution to PIPELINE CONSTRUCTION

THE CLEVELAND TRENCHER COMPANY
"Pioneers of the Small Trencher"
20100 ST. CLAIR AVENUE CLEVELAND, OHIO

4" LATERAL
entering 6" Main

Both the 4" and the 6" lines above were coupled-up with ready-made "Dressers." Plain-end pipe was used—and the only tool, was a wrench.

•

Overnight delivery of "Dressers" to the Southwest from complete stocks at Houston

PHONE: CHARTER 4-4723; L.D. 2107

DRESSER
HOUSTON WAREHOUSE
1121 Rothwell St. Sec. 16, Houston, Texas

Moore

KAY DERRICKS HANDLE DEEPEST

It has not been just a matter of chance or circumstance, that Moore KAY DERRICKS have been placed over the World's Deepest Well, and so many other deep wells.

A critical evaluation of equipment required to do the job, as economically and safely as possible, plus the records of previous performances of KAY DERRICKS on deeper wells throughout the world have determined, in most instances, the choice of Lee C. Moore equipment. Moore engineers are constantly endeavoring to improve this equipment — *Moore Equipment — More Oil — More Gas.*

WORLD'S DEEPEST WELL
April 12, 1944

Hole bottomed at	15,279 ft.
Months after spudding surface hole	21½
Drill pipe 13.3 lb. I.F.E.U., Grade "D"	3½" O.D.
Total dead weight, calculated	221,316 lbs.
Calculated weight, considering buoyancy of mud	199,160 lbs.
Final casing string	5½"
Landed on bottom in	18½ hrs.
Total dead weight with letting in joint	312,414 lbs.

The Moore KAY DERRICK used on this well had been used on several other wells

Exploration and Drilling

Week's Highlights

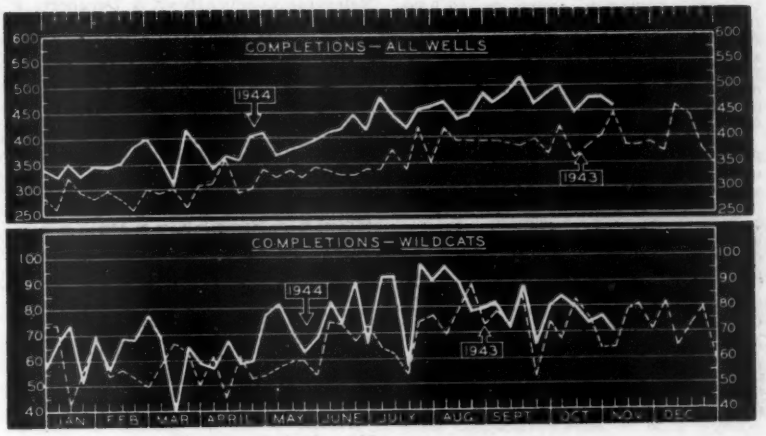
UNUSUAL interest accrues to a promising looking wildcat in Franklin County, Illinois, because of the great demand for oil in that state. Deep Rock Oil Corp. et al 1 Kirk trustee, NE SE SE 15-7s-4e, on a 90-minute drill-stem test in the Aux Vases sand, recovered 850 ft. of clean oil, 120 ft. of oil-cut mud, and 60 ft. of fresh water, probably drilling water.

The test was drilled to a total depth of 3,149 ft., surface elevation 496 ft., and found 12 ft. of Aux Vases with apparent good porosity and permeability, topped at —3,121 ft. Pipe is now being run and the well will be tested.

If successful, this test will probably stir up substantially more wildcatting along the south edge of the Illinois basin. Admittedly it is approaching the south rim, and the Tar Springs sand is reported to have been rather glassy. However, under present conditions, considerable wildcat testing has been going on around the western rim of the basin. If the limits of possible production can be stretched further south than previously believed, wildcatting there offers possibilities equally as good as the western rim.

Feeling out the edges of an oil-producing geoolgical basin for new pools is quite similar to feeling out the edges of an individual field. There are advantages in that the surface area with possibilities has been narrowed considerably by the accumulated geological data from previous developments. There are disadvantages in that the probable return on the investment will be only moderate at best. Careful balancing of costs with geological probabilities is a necessity if the operation is to be profitable.

The nearest Aux Vases production to the Deep Rock test is in the Rural Hill pool, some 6 to 8 miles north and west. In the Thompsonville pool, about 2 miles south, some production has been obtained from the Rosiclaire, but none from the Aux Vases. The local structural aspects of the current strike are not marked, and possibly it might be a stratigraphic trap formed by lensing of the Aux Vases. This would have a bearing on the possibilities of finding deeper oil in the McCloskey lime.



Solid line charts current weekly completions

COMPLETIONS IN ALL FIELDS . . .

Week ended November 4, 1944

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.*	57	26	5	88	162,718	2,978	2,908
Ohio	1	10	11	22	65,388	853	793
Indiana	0	0	1	1	2,630	214	186
Kentucky	7	1	6	14	22,751	831	390
Illinois	32	0	12	44	125,201	1,602	1,504
Michigan	9	0	12	21	50,831	573	541
Kansas	14	3	15	32	106,563	1,536	1,418
Nebraska, Missouri, Iowa	0	1	1	2	1,190	35	43
Oklahoma	27	2	12	41	176,884	1,522	991
Texas:							
North Central	11	1	15	27	71,090	1,230	1,258
West	29	1	2	32	132,187	1,332	774
Panhandle	5	0	4	9	26,592	237	155
Eastern	4	2	7	13	65,367	277	249
Gulf Coast	15	0	7	22	149,687	1,062	397
Southwest	7	1	7	15	59,995	582	778
Total Texas	71	5	42	118	504,918	4,720	3,611
Louisiana:							
Northern	5	1	2	8	33,734	272	270
Southern	5	1	2	8	81,617	400	309
Total Louisiana	10	2	4	16	115,351	672	579
Arkansas	2	0	1	3	16,695	184	226
Mississippi	2	0	2	4	17,051	120	83
Southeastern States	0	0	0	0	0	44	†
Montana	7	1	2	10	18,105	305	201
Wyoming	4	0	0	4	21,512	147	118
Colorado-Utah	0	0	0	0	0	30	21
New Mexico	8	2	0	10	29,963	340	196
California	33	0	8	41	145,507	1,695	1,151
Total United States	284	53	134	471	1,583,258	18,201	14,960
Total previous week	291	51	134	476			
Total Nov. 6, 1943	264	28	156	448			

*Does not include 53 service wells. †Included in total shown for Mississippi.

TEXAS GULF COAST

Gas-Condensate Production Opened in Colorado County

HOUSTON. — New gas-condensate production is being opened in Colorado County at Tide Water Associated Oil Co. 1 D. L Underwood, wildcat 3 miles northwest of Sheridan. Total depth 9,990 ft., shale, with 7-in. casing set at 9,962 ft., perforations at 9,500-02 ft., now drill-stem testing, ¼-in. and 3/16-in. chokes, showing 2,550 lb. working pressure and flowing at the rate of 144 bbl. fluid per day, 11 per cent wash water, with 1,620,000 cu. ft. gas. Gravity of the condensate is 57°.

Houston Oil Co. of Texas and American Republics Corp. 1 Hardin-fee, new field opener on north edge of Hardin County, gaged 46,000,000 cu. ft. daily flow of gas on open flow, showing tubing pressure 2,050 lb., casing pressure 2,200 lb. on 9/64-in. choke, no gage reported on the amount of condensate made. Completion is in perforations at 5,796-5,807 ft., total depth 7,006 ft., with 5½-in. casing at 5,880 ft.

Skelly Oil Co. 1 Granbury-Fullilove, wildcat 3 miles northeast of Van Vleck in Matagorda County, ran drill-stem test in perforations 8,767-69 ft., open 8 hours, flowed 2 bbl. of 34.4°-gravity oil and 4 bbl. of water, 236,000 cu. ft. gas on 5/64-in. choke, tubing pressure 2,450 lb., casing pressure 3,125 lb. More perforations were made from 8,769-71 ft. and operators are now running a new test. Total depth is 10,010 ft., with 5½-in. casing set to 8,854 ft.

The Texas Co. 14 Broussard Trust, at Fig Ridge field, Chambers County, flowed potential of 400 bbl. daily on 12/64-in. choke, gas-oil ratio 731 to 1, from 28 perforations at 8,548-55 ft., tubing pressure 1,125 lb., gravity 36.3°, no water, total depth 8,600 ft., with 5½-in. casing at 8,600 ft., plugged-back total depth 8,563 ft.

Sun Oil Co. 4 Federal Land Bank, at Fig Ridge field, Chambers County, flowed potential of 274 bbl. daily on 10/64-in. choke from perforations, 40 holes, at 8,463-70 ft., gas-oil ratio 631 to 1, tubing pressure 1,275 lb., gravity 35.3°, 0.1 per cent water, total depth 8,617 ft., and 5½-in. casing set on bottom, with 2-in. at 8,443 ft.

McCarthy et al are reported to have extended production at the Fannett field, Jefferson County, bringing in the 1-A Burrell, flowing around 600 bbl. daily on ¼-in. choke from perforations at 7,285-7,310 ft., tubing pressure 625 lb., casing 800 lb., gravity 39°.

UPPER GULF COAST WILDCAT COMPLETIONS

Matagorda County: Hewit & Dougherty 1 J. J. Fortenberry, 5 mi. west of Midfield, dry at 7,553 ft.

Wharton County: Drilling & Exploration Co., Inc. 1 T. W. Gresham, 2¼ mi. northwest of Hillje, dry at 6,015 ft.

SOUTH LOUISIANA

Humble Swabbing Its Avery Island Test

NEW ORLEANS.—Humble Oil & Refining Co. 2-B Petit Anse Co. at Avery Island, in Iberia Parish, plugged back to 9,554 ft., set 2½-in. at 9,491 ft. It flowed for 1 hour and died, is now swabbing. Total depth is 10,537 ft. in salt. The 7-in. casing was set at 9,575 ft.

Humble 1 C. G. Robinson at Laurel Ridge field, Iberville Parish, is testing in perforations 10,551-53 ft., was flowing 70 per cent oil and 30 per cent water at end of the last test, on ⅞-in. choke, tubing pressure 1,600 lb. with water showing some decrease. The flow has been killed, probably to kill and reperforate. Total depth is 10,710 ft. with 5½-in. set on bottom.

California Co. completed the 4 E. K. Vail at Delta Farms field, La Fourche Parish, flowing 285 bbl. per day on 9/64-in. choke from perforations 9,404-29 ft. Tubing pressure 1,550 lb., gravity 35.6°, 0.1 per cent water, gas-oil ratio 790 to 1. Total depth is 10,133 ft.

The Texas Co. 1 J. B. Ferguson at Krotz Springs in St. Landry Parish, drilled to total depth 10,280 ft., set 5½-in. liner on bottom, perforated 18 shots at 9,417-20 ft., flowed 85 bbl. per day on 6/64-in. choke, gas-oil ratio 930 to 1, tubing pressure 1,550 lb., gravity 36.3°, no water.

CALIFORNIA

Standard's Deep Test Reaches 15,702 Ft.

LOS ANGELES.—Standard Oil Co. of California's super deep test in the South Coles Levee field of Kern County has reached a depth of 15,702 ft., and is still going ahead. The formation is reported to be lower Miocene in age and consists of sand and shale. As far as can be determined the Vedder interval has been passed but with Miocene formations present the well still has a chance of developing production below the present bottom.

Completions in the Elk Hills field were above the general average this week and there are still several additional potential producers being rigged up. The first well blowout occurred at Elk Hills since the start of the present development program but it was under control at all times and was killed without difficulty. The well did not blow out but rather blew in from 3,000 ft. Pumping wells are the rule rather than the exception in this field although 34-32-S in 32-30s-24e, a recent completion, was finished as a flowing well from 2,500 ft. making 125 bbl. of clean 27.6°-gravity oil and 1,209,000 cu. ft. of gas through 40/64-in. beam. It settled, however, to 86 bbl. of oil and 700,000 cu. ft. of gas a few days later.

Sheep Springs in Kern County discovered a few weeks ago by Rothschild & Bender registered another blowout when I Anderson of the same operator blew seven stands of drill pipe out of the hole on a formation test. No difficulty was experienced, however, as the crew closed the master gate and brought the well under control. At the time of the formation test the bit had been in oil sand at 3,059 ft. with a string of 7-in. cemented at that depth. On a test of gun-perforated interval at 2,970-82 ft. the well, behind a 300-ft. water cushion, showed a heavy steady gas blow estimated at 3,000,000 to 5,000,000 cu. ft. A formation test at 2,988-98 ft. was in progress when the well blew out. This is the second well in this area to show high gas pressure as the initial well also showed a substantial kick. A third well is in progress and should reach the pay within another few days. These operations are about 1 mile southeast of a small well finished by Union Oil Co. in 18-29s-21e.

Shell Oil Co., Inc., is starting a new well in the Dominguez field which will be carried down to the basement for a thorough test of formations existing in that field. This field is block faulted and although Union drilled one well to the basement it is not thought that one well condemns deeper zone possibilities due to subsurface faulting. At Long Beach, Shell is starting all over again in a projected deep test after reaching 1,610 ft. where circulation was lost and could not be reestablished in the original hole, 48 Alamitos. A supplementary hole, 48-A Alamitos, is at present rotating ahead at 3,640 ft. and has 1,002 ft. of 18⅝-in. casing cemented in the hole as a conductor string. This well is scheduled to be carried much below the 10,000-ft. Dormax zone. At West Montebello, Union is not having any luck with 3 Howard & Smith and the hole is being tested on the way out from 10,722 ft.

CALIFORNIA WILDCAT COMPLETIONS

La Jolla wildcat district, San Diego Coun-

DAILY AVERAGE PRODUCTION FOR WEEK

	Nov. 4 crude oil	Distillate, allied products	November PAW quota all oils	Oct. 28 crude oil
Arkansas	80,500	5,100	83,100	80,800
California	875,350	52,400	937,400	883,250
Colorado	8,900	.....	9,000	9,200
Eastern	67,950	8,200	80,200	68,100
Illinois	203,400	12,200	212,200	200,900
Indiana	13,400	.....	13,000	13,100
Kansas	260,200	6,000	280,000	286,900
Kentucky	30,900	2,800	28,800	28,900
Louisiana	363,950	35,000	385,000	363,050
North Louisiana	73,300	.....	.....	73,300
South Louisiana	290,650	.....	.....	289,750
Michigan	46,550	500	51,000	48,200
Mississippi	49,300	.....	50,000	49,050
Montana	23,400	400	24,400	24,250
Nebraska	950	.....	1,000	950
New Mexico	104,500	5,500	115,500	104,750
Oklahoma	360,000	26,900	371,900	347,350
Texas	2,132,800	145,000	2,278,000	2,133,350
East Texas	369,400	.....	.....	371,300
East Central Texas	146,700	.....	.....	149,450
North Central Texas	150,200	.....	.....	148,800
Texas Panhandle	96,150	.....	.....	98,850
West Texas	482,050	.....	.....	492,900
South Central (S. A.)	19,950	.....	.....	19,700
South Texas (Laredo)	78,650	.....	.....	77,850
Lower Gulf Coast	243,000	.....	.....	236,900
Upper Gulf Coast	546,700	.....	.....	537,600
Wyoming	97,300	3,400	103,400	95,700
Total United States	4,719,350	303,400	5,023,900	4,737,800
Change from previous week	down 18,450	.....	.....	.....

Total production January 1-November 4, 1944 ..... 1,403,850,850 bbl.
Same period last year ..... 1,251,700,410 bbl.

ty: La Jolla Pet. Co. 1 La Jolla, 32-15s-3w, dry in basement schist, form. test 2,090-2,310 ft. recovered 1 stand mud, top Pliocene 1,010 ft., top Eocene 2,310 ft., top Cretaceous 3,220 ft., top schist 3,720 ft., TD 3,751 ft.

Los Alamitos outpost well, Santa Barbara County: Southern Calif. Pet. Corp. and J. J. Anderson 2 Archambeault, 3-7n-32w, dry in buff and brown shale, showed 40° dips in lower part of hole, no showings, TD 6,026 ft.

Mountain View outpost well, Kern County: Richfield 1 Cauley, 36-30s-29e, dry in basement granite, no showings, top granite 1,295 ft., TD 1,311 ft.

San Joaquin wildcat district, Fresno County: Superior 83-30 Hanneman, 30-15s-17e, dry, no showings encountered, second wildcat drilled same area by Superior, this hole lower structurally, TD 7,351 ft.

SOUTHWEST TEXAS

Magnolia Opens New Bee County Field

CORPUS CHRISTI.—Magnolia Petroleum Co. 1 W. E. Erp, 9 miles west of Pettus in Bee County, total depth 7,605 ft., opens a new field producing from perforations in 6,970-ft. sand flowing 67 bbl. oil and 23 bbl. of water in 20 hours, through 7/64-in. choke, tubing pressure 700 lb. Name for the field has not yet been announced.

Smith & McBride, Inc., 1 W. C. McCaskill, Jr., wildcat in Porter area, Karnes County, 5 miles south of Runge and just south of Pettus production, tested salt water in perforations 7,421-22, reperforated 7,404-09, cleaned as gas-condensate well on ⅛-in. choke, tubing and casing pressure equalized at 2,000 lb., no water, estimated 25 bbl. per million feet of gas; total depth is 8,650 ft., with 5½-in. casing set at 7,500 ft.

Stanolind Oil & Gas Co. 2-B J. T. Gillette, in the Petronilla area, Nueces County, is waiting on cement to set after setting 7-in. casing to 8,349 ft. Total depth is 8,350 ft. Last drill-stem test was run at 8,328-38 ft., which recovered 30 ft. of oil, 270 ft. of salt water and 330 ft. of mud in 18 minutes using ¼-in. bottom and ⅜-in. top chokes, bottom-hole pressure 1,150 to 1,200 lb.

Blanco Oil Co.-Al Buchanan 1 Eureka College, wildcat 5 miles northwest of Falfurrias, in Jim Wells County, is drilling below 6,400 ft. after coring no shows at 6,260-6,380 ft.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Atascosa County: P. G. Northrup 1 Thornton Stevens, about 4 mi. SW of Verde, in I&GN Sur. 1747, dry at 1,503 ft.

Bastrop County: Continental Oil Co. 1 Mikulenka, 5 mi. SE of Kirtley, in William Barton Sur., dry at 4,300 ft.

Bee County: Luling Oil & Gas Co. 1 W. E. Ruckmann, 7 mi. N of Burnell, in J. J. Sanchez Sur., dry at 6,315 ft.

Duval County: Edwin B. Cox, John F. O'Neil, C. E. Yoakum and Jake L. Hamon 2 Clara Driscoll, 13 mi. NW of Benavides, Sec. 44, Santa Rosalia Rafael Ramirez grant, dry at 2,462 ft.

Fred Shield and J. W. Gorman et al 1 A. G. Black, 12½ mi. NE of San Diego, in J. Poitevent Sur. 129, dry at 5,019 ft.

Taylor Refining Co. 4-A E. A. Parr, Sur. 303, dry at 5,584 ft.

Goliad County: Amerada Petroleum Corp. 1 Mrs. John Hoff et al, 12 mi. NE of Goliad, in Barton Peck Sur., Abst. 239, dry at 10,792 ft.

Jim Wells County: Smith & Story, Inc., 1

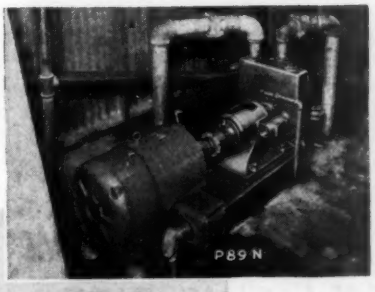
Overhead Driven Pumps Fit Confined Spaces

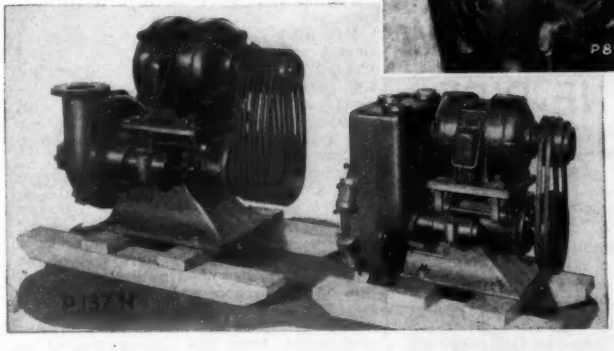
An obvious saving in space, easier accessibility of motor and other features mark those horizontal type Amsco-Nagle pumps that have overhead-mounted motors. Where space is not restricted the conventional in-line unit, as shown in P-89-N is ordinarily used.

The overhead drive (P-137-N) is a winner for installations where floor space is limited. These compact units not only save "square feet" but also make motor adjustments easier and insure against possible flooding of motors.

Amsco-Nagle pumps have won a place in the petroleum industry because they afford excellent service life with low maintenance in handling corrosive liquids and abrasive-laden fluids having a severe scouring action. The "water end" of every pump is made of the metal best suited to withstand the particular abrasive or corrosive conditions. All parts are readily accessible for adjustments and repairs. Three vertical and two horizontal types are available in sizes from ¾" up to 16" discharge.

Ask for Bulletin No. 940.





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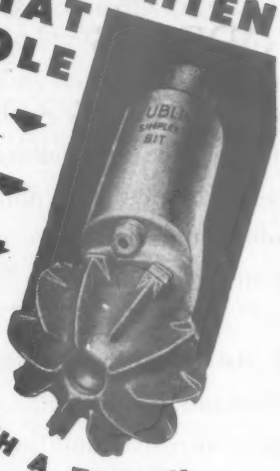

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WHEELING MACHINE PRODUCTS COMPANY
WHEELING, WEST VA.

Alfred Ehrig, Sur. 88, 14 mi. N of Alice, dry at 2,786 ft.

Magnolia Petroleum Co. 1 J. R. Caldwell, 5 mi. W of La Gloria, in Copita Farm & Garden Trs., Lot 3, Blk. 1, dry at 7,294 ft.

Starr County: Sun Oil Co. 1-A Annie Reilly Estate, Porcion 97, 15 mi. SE of Rio Grande City, dry at 5,380 ft.

ROCKY MOUNTAIN

Embar and Tensleep Wells Maintain Interest

DENVER.—The discovery in the Embar lime at Big Sand Draw, Fremont County, Wyoming, and indications of an equally important strike in the Tensleep in Sinclair-Wyoming Oil Co. 1 Unit, SW NW NW 14-32n-95w, continues to be an outstanding development in the Rocky Mountain area. After taking a drill-stem test at 6,930-55½ ft., open 17 minutes, which showed for 15,000,000 cu. ft. of gas and 20 gal. of 54° gravity distillate, with a shut-in pressure of 3,350 lb., drilling has continued without further stops for tests due to the heavy pressure and efforts to avoid a blowout. The first saturation was picked up at 6,896 ft., and a drill-stem test at 6,896-6,913 ft., open 57 minutes, showed 1,560 ft. of oil and 633 ft. of oil-cut mud. The saturated formation continued to 7,060 ft. or a total of 174 ft. It is drilling ahead at 7,150 ft. in dolomite and is estimated to be about 80 ft. above the break on top of the Tensleep. The oil in the upper part of the formation (called the Dinwoodie by some) tested 32.8° gravity and was sulfur free.

Crook's Gap discovery. — Sinclair-Wyoming Oil Co. apparently has opened a new light oil field on the Crook's Gap structure in Fremont County, Wyoming, in its 1 State, NW SW NW 18-28n-92w. It topped the Dakota sand at 3,234 ft., and then took a core at 5,244-48 ft., recovering 3 ft. of saturated formation. A drill-stem test then was taken at 5,234-48 ft., open 47 minutes. It flowed gas for 32 minutes and then began making oil at the rate of 50 bbl. an hour when the packer was unseated. The gravity of the oil was 37.1° and the shut-in presure was 2,600 lb. The hole then was deepened and another test made at 5,282-5,391 ft. in the Lakota. Open 10 minutes it showed 1,680 ft. of oil and 570 ft. of water from that horizon.

Bell Rock test. — Stanolind-Ohio-Continental joint test on Bell Rock, Moffat County, Colorado, in 1 Hanewalt, NE SE SE 4-6n-92w, is drilling at 8,950 ft. in hard sand, probably the Sundance, with no shows. Several drill-stem tests in the Morrison and Sundance so far have shown nothing of importance.

Horse Creek discovery.—General Petroleum Corp. 78-31-G, SW SE SE 31-17n-68w, Horse Creek structure, Laramie County, Wyoming, a discovery in the Dakotas late in 1942 which resulted in a lease play in the northwestern area of the Denver basin, has been plugged back and put on production after making a deep test. In November 1942 it pumped 500 bbl. gross, cutting 20 per cent basic sediment and water, from the Lakota topped at 5,451 ft. Subsequently it went to water and in 1943 it was deepened through the Minnelusa, the productive horizon in Lance Creek, to 7,457 ft. It was then plugged back to the Lakota and shut down until recently when it was cleaned out and put on the pump, making an estimated average of 30 bbl. per day.

MONTANA WILDCAT COMPLETIONS

Big Horn County, Hardin: C. H. Mulcahy No. 1, SE 25-1n-32e, dry at 1,165 ft., no gas.

Toole County: West Utopia: Texas 1 Hansen, NE SW NE 21-33n-2e, TD 2,110 ft., top of Madison 2,108 ft., sulfur water, dry.

EASTERN TEXAS

Wood County Test Shows Oil in Sub-Clarksville

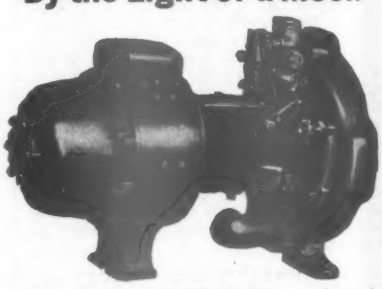
DALLAS.—Oil shows in the sub-Clarksville zone turned attention at close of last week to Bobby Manziel 1 Evans, wildcat 1½ miles east of Quitman, Wood County, and in the J. Stark Survey. With elevation of 440 ft., it topped Austin chalk at 4,625-55 ft., based the chalk at 4,815-20 ft., and core from 4,855-60 ft. was sand with show of heavy oil, core from 4,880-4,910 ft. was sand with fairly good odor. A drill-stem test was planned at that depth.

Robertson County.—Hamman Oil & Refining Co. 2 Gibson, 950 ft. northeast of the same company's shallow discovery well 5 miles west of Calvert, ran electric log and prepared to abandon at total depth 2,242 ft. The basal Navarro sand, productive in the producer, was shaled out in the 2 Gibson. Rig will be moved to a new location in the same vicinity.

Rusk County.—H. C. Owen 1 Rousseau, 8 miles southeast of Henderson, which showed some gas and a small amount of amber-colored distillate from the Travis Peak at 7,382-89 ft., had a slight show of gas and flowed salt water on a subsequent test of the Pettit zone at 7,110-23 ft. After squeezing off the holes at 7,110-23 ft., with perforations at 7,382-89 ft. still open, it swabbed 100 per cent salt water and prepared to resqueeze and test again at 7,382-89 ft.

Smackover failure.—Barnsdall Oil Corp.

"By the Light of a Moon"



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and Sohio Oil Co. 1 Hill, a west offset to their Smackover lime discovery well southwest of Texarkana, Bowie County, is reported abandoned after logging metamorphic and igneous rock all the way from 7,696-7,825 ft., total depth, with Smackover section missing.

EAST TEXAS WILDCAT COMPLETIONS

Fannin County: Texas Mineral & Land Co. 1 J. H. Wharton, Wm. M. Rice Sur., A-993, 6 mi. SE Savoy, elev. 707 ft., Paluxy 2,266-95 ft., Ouachita 3,210 ft., dry, TD 4,100 ft.

N. I. Wynn 1 J. R. Lowery, Hammond Smith Sur., ¾ mi. W Dodd City, dry, TD 970 ft.

Kaufman County: T. D. Humphries 1 J. E. Wimpee, C. Williams Sur., A-592, 4 mi. NE Kemp, elev. 416 ft., dry, TD 3,331 ft.

Nacogdoches County: Roberts Oil Co. 1 R. E. Ramblin, John Simpson Sur., A-521, 5 mi. SE Appleby, elev. 360 ft., dry, TD 1,650 ft.

Titus County: R. L. Peveto and J. B. Stephens 1 W. C. Farrar, Wm. Walker Sur., 4½ mi. N Talco, elev. 313 ft., dry, TD 3,803 ft.

Van Zandt County: Northern Ordnance, Inc., 1 Shelton, Leander Smith Sur., 1 mi. SE Martin's Ferry, elev. 530 ft., ft., dry, TD 9,200 ft.

PERMIAN BASIN

Six Wildcats Announced In That Many Counties

MIDLAND.—Six wildcats in as many counties were announced in West Texas during the week. In Lamb County, Humble Oil & Refining Co. 1 R. L. Bagwell, to go to 7,500 ft., was staked in Labor 25, League 673, Capitol lands, 3 miles southwest of Littlefield. Humble 1 Jackson, now drilling in southeastern Lamb County, was preparing to use nitroglycerin shot on open hole at 5,352-5,921 ft., with plugged-back depth 6,050 ft., after bailing about ½ bbl. of oil and water per hour natural.

Hilo Oil Co. 1 E. F. Cowden was staked as a 5,500-ft. test southeast of the Harper field, Ector County, in Section 31, Block 43, T-2-S, T&PRR Survey. In east central Martin County, Richfield Oil Corp. is starting 1 Clements, Section 22, Block 35, T-2-N, to go to 5,000 ft. In Howard County, Lilly Oil Co. 1 B. F. McKinney is a new 3,500-ft. wildcat in Section 42, Block 30, T-1-N.

Pratt-Hewitt Co. 1 Dick Slaughter, Cochran County, was staked 2 miles north of Whiteface area production, spotted in Labor 13, League 85, Shackelford CSL. In Andrews County, on a lease recently purchased at University auction for $62,000, Stanolind Oil & Gas Co. 1-P University is being started as a 7,500-ft. test. It is 3 miles south of Mid-Continent Oil Corp. 1-7 University, a recent Siluro-Devonian lime discovery, 1½ miles south of the Fullerton field. In addition to these wildcats, Seaboard Oil Co. 1 Craven, 9 miles north of Lubbock, now bottomed at 5,451 ft., with 7⅝-in. casing cemented there, will be deepened to 8,000 ft. Originally contracted to 5,500 ft., Stanolind is reported to have acquired a half interest in the well and its 160-acre site.

Amerada Petroleum Corp. 1 TXL is a new operation in the active western Ector County area, approximately ½ mile northwest of the Shell-Cities Service discovery which last week was drilling below 9,740 ft. in sand and shale, with the Ellenburger its objective.

Possibility that Devonian pay will be developed in the 10,000-ft. Wheeler-Ellen pool, eastern Winkler County, was seen

(Continued on page 142)

OKLAHOMA

W. Edmond Tops State Pools in Production

THE West Edmond field passed Oklahoma City in production this week, to become the largest producing field in the state. Total pipe-line runs were reported at 44,600 bbl. daily from 212 wells, an increase of 13,800 bbl. daily, and 18 wells connected. The Oklahoma City field at 41,900 bbl. dropped out of first place, for the first time in several years. The rush of production from West Edmond pushed the Oklahoma state production to 360,000 bbl. daily, the highest since November 1942. Total completions in West Edmond at week end were 219.

West Moore.—The whole picture in this pool, which has been looking increasingly sour, was changed when J. E. Crosbie, Inc., 1 Stotts, NE SE 30-10n-3w, topped the second Wilcox sand at 8,692 ft., stopped at 8,712 ft., and took a drill-stem test. With packer set on top of sand and a ¼-in. bottom-hole choke, the well made air in 4 minutes, gas in 12 minutes and oil in 18 minutes. The oil flow was so heavy the well shut in after a 2-minute flow. The Stott well opens up possibilities to the west and indicates the discovery well was on the east edge of the pool.

Anadarko basin. — Superior Oil Co. of California's announcement of an immediate test starting in the Anadarko basin has touched off some more announcements of locations and the basin play which was expected to start in the early spring is now speeded up. Phillips Petroleum and Carter Oil Co. announced a test in 28-16n-5w, Kingfisher County, just west of the South Crescent pool. Sin-

(Continued on page 142)

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ARMY E NAVY

LaPLANT-CHOATE
Earthmoving and Land Clearing Equipment

MICHIGAN

Brisk Pace in Operations Continues Unabated

SAGINAW.—The brisk pace of field operations shows no signs of abating, with 22 more drilling permits issued in the past week by the state conservation department, more than keeping pace with the rate of completions, which numbered 21 for the same period.

While four of the nine oil producers on the list were in Allegan County, including a 336-bbl. well in Fillmore Township, the best producer was Gulf Refining Co. 1 Dagzy in Chippewa Township, Mecosta County, which flowed 384 bbl. pinched, naturally. Two other fairly good wells were producing from deeper than 4,000 ft.

Wildcatters had little new encouragement, however, as they completed 10 of the 12 dry holes on the week's list. They were in 7 of the 13 counties in which there were completions.

Osceola County locations are shown for 5 of the 22 new permits, Isabella and Arenac counties getting 3 each, Montcalm and Newaygo 2 each, the others being Allegan, Bay, Clare, Ionia, Missaukee, Monroe and Saginaw.

MICHIGAN WILDCAT COMPLETIONS

Allegan County, Fillmore Township: J. W Lang Co. 1 W. Kleinheksil, NW SE SE 22-4n-15w, dry in Traverse limestone, TD 1,534 ft.

Trowbridge Township: P. F. Broughton 1 William Lane. NW SE NW 8-1n-13w, dry in Traverse limestone, TD 1,401 ft.

Arenac County, Deep River Township: R. L. Barr 1 John Wojtowicz, et al, C NW 27-9n-4e, dry, TD 155 ft.

Isabella County, Coe Township: Chartiers Oil Co. 1 Kirkconnell community, C N½ NW SW 21-13n-3w, dry in Dundee, TD 3,637.

Deerfield Township: C. W. Collin 1 J. A. Weidman estate, SW SW NE 27-14n-5w, dry in Dundee, TD 3,705 ft.

Lincoln Township: Allegan Pipe & Supply Co. 1 B. Duffy, SE NE SE 27-13n-4w, dry in Monroe, TD 3,599 ft.

Muskegon County, Dalton Township: Jacob Bolema 1 Ed Medendorp, SE SE NW 24-11n-16w, dry in Traverse limestone, TD 1,865 ft.

Newaygo County, Big Prairie Township: Sun Oil Co. 2 Consumers Power Co., C N½ NW SE 16-13n-11w, dry in Monroe, TD 3,322 ft.

Osceola County, Orient Township: Chapman Oil Co. 1 Omaw Huff, S½ NW SW 32-17n-7w, dry, TD 1,648 ft.

Van Buren County, Bangor Township: W. H. Clock 1 James Taylor, NE NW SE 1-2s-16w, dry in Traverse limestone, TD 1,029 ft.

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N. CENTRAL TEXAS

Two Grayson County Tests Now at Critical Depths

WICHITA FALLS.—Two Grayson County wildcats were at critical depths late last week. Seitz, Comegys & Seitz and Humble Oil & Refining Co. 1 Walling, 2 miles northeast of Tioga, topped Ellenburger at 4,220 ft. and was drilling at 4,279 ft. On a 20-minute drill-stem test at 4,168-84 ft. it had recovered 600 ft. of salt water with a show of gas. Pure Oil Co. 1 Little, just southwest of Gordonville, drilled hard sand and shale with brown stain at 7,860-70 ft., fine silty sand and brown stain and slight odor at 7,870-80 ft., slightly coarse sand with brown stain and odor at 7,880-90 ft. and prepared to take a core at that point.

Fain & McGaha Oil Corp. 1 O. A. Ross, outpost in the Ross pool, and 4½ miles southwest of Jolly, Clay County, gaged 411 bbl. oil in 8 hours through open 2-in. tubing after using 3,000 gal. of acid on Caddo lime pay through casing perforations at 5,395-5,435 ft. Previously it tested 75 bbl. daily from Ellenburger pay at 5,648-64 ft., total depth. It is in Section 7, BBB&CRR Survey, A-49.

North of Sivel's Bend, in northern Cooke County, The Texas Co. is putting its 1 Rasure, 6,760-ft. Strawn sand discovery, on the pump, and is moving rig over to drill a west offset. Texas 1 Gainesville National Bank, wildcat in Thomas Ward Survey, 12 miles northeast of Gainesville, recovered 60 ft. of oil and 800 ft. of salt water on drill-stem test at 4,036-46 ft. and was drilling ahead. R. W. Fair & Sons 1 A. L. Walterscheid, E. Langford Survey, 7 miles southwest of Muenster, was preparing to make drill-stem test of conglomerate showing oil at 3,098-3,108 ft. A previous test, at 3,079-94 ft. recovered 20 ft. of oily mud.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: Fortex Oil Corp. et al 1 L. F. Wilson, Grayson CSL, 7 mi. S and 1 mi. E Holliday, dry, TD 1,600 ft.

George Proctor 1 J. D. Powell et al, H. A. Allen Sur., A-3, 3 mi. E and 1 mi. N Archer City, dry, TD 1,349 ft.

Staley Oil Co. 1 E. Colgan, D. A. Murdock Sur., A-284, 3 mi. N and ½ mi. E Megargel, dry, TD 1,500 ft.

Cooke County: The Texas Co. 1 Ben Bengfort, Timothy Jessup Sur., A-523,

(Continued on page 142)

APPALACHIAN FIELD

United Completes Oriskany Test as Large Gasser

PITTSBURGH.—In West Virginia, United Fuel Gas Co. completed the Oriskany test on Edward Gebhart farm in Elk district, Kanawha County, as an unexpectedly large gas well. It gaged 10,000,000 cu. ft. gas open flow which after blowing open for 10 hours while setting a control head, froze down to 2,000,000 cu. ft. This opens a new extension to the Elk-Poca gas field. This well is 4 miles east of the nearest Oriskany gas well at the southeastern tip of the Elk-Poca pool. Though limited north and south by dry holes, there is sufficient area for additional tests.

In Freemans Creek district, Lewis County, Hope Natural Gas Co. is drilling through the Oriskany sand at its test 8,874 J. L. J. Bailey, with gage of 83,000 cu. ft. gas at 6,944 ft. The gas was 30 ft. in the sand and in the "A" member. This was also believed true of the first Oriskany test in the area drilled by rotary.

In Lincoln County, there is a showing of Big Lime oil in Spartan Gas Co.'s test on Huntington Development Gas Co. in Jefferson district with the Big Lime topped at 1,655 ft., total depth 1,772 ft. It is making better than 10 bbl. a day and may be a new local pool.

In Barbour County, Hope Natural Gas Co. improved its recent Benson sand exploration with its test 8,889 Ara B. Rymer in Elk district which gaged 762,000 cu. ft. gas from the Benson sand at total depth of 4,507 ft.

In southwest Pennsylvania, Greensboro Gas Co. is drilling in the Onondaga chert at 6,884 ft. in 5 Barton on Chestnut Ridge in Wharton Township, Fayette County, with the first gas showing at 6,855 ft. The chert was topped at 6,823 ft.

CANADIAN FIELDS

Steveville Discovery Produces in Devonian

CHATHAM.—In the Steveville field, east of Calgary, Standard Oil Co. of California 8 Princess, LSD 16, 21-20-12w4, finished at 3,883 ft., produced 4,824 bbl. of 34.5°-gravity crude from the Devonian limestone during 4 weeks of experimental tests, and is believed good for 200-250 bbl. daily through 11/16-in. choke. Some crude has been shipped to British-American refinery at Moose Jaw, Saskatchewan. This is the first commercial production from the Devonian limestone in Alberta, and has directed attention to the possibilities of this formation which underlies 375,000 square miles in southern Alberta, Saskatchewan and western Manitoba. Earlier wells in the Steveville-Princess area got production in a higher formation.

Sullivan Creek.—On the Sullivan Creek structure, south and west of Turner Valley, Phillips Petroleum Co. has spudded its first test in Alberta.

Nova Scotia.—The first well ever to be drilled in western Nova Scotia was spudded by Nova Scotia Oil & Gas Co. at Kennetcook in Hants County. Tests will be carried to around 3,000 ft. in the expectation that the oil and gas-bearing formations of the New Brunswick field extend into Nova Scotia. The company holds a grant of drilling rights on 553,000 acres in Hants County from the Nova Scotia Government, which in the effort to se-

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Sturtevant
Puts Air to Work

cure oil and gas development has granted drilling rights to other interests in Inverness, Guysboro, Antigonish and Pictou counties and on Cape Breton Island.

MISSISSIPPI

Jeff Davis and Lamar Tests Being Watched Closely

JACKSON.—Primary interest was still centered on two important wildcats, both Gulf wells, one a possible 3-mile extension of the Gwinville discovery of S. W. Richardson in Jeff Davis County, the other the Lamar County Cooper wildcat. There is considerable interest in the fact that The California Co. 9 National Gasoline in the Cranfield pool in Adams County was reported to have found 100 ft. of saturated Massive sand and is potentially the best well in that field to date.

Jeff Davis County.—Gulf Refining Co. 1 Mullens, NW NE 34-9n-19w, about 3 miles southwest of S. W. Richardson's gas-condensate discovery in the Gwinville field had the Eutaw at —7,510 ft., and top of Tuscaloosa at —7,665 ft. On first drill-stem test at 8,020-50 ft. (Eutaw 8,002 ft.), well unloaded 900 ft. water cushion in 10 minutes, showed gas only. On second drill-stem test at 8,119-40 ft. (Tuscaloosa 8,158 ft.), using 1,300-ft. water cushion, 540 ft. of water cushion was recovered with a trace of 46° gravity, straw colored distillate. At 8,221-25 ft. a core showed fairly porous sand with odor and bleeding light brown oil.

Lamar County.—Gulf Refining Co. 1 Cooper, NE NW 7-1n-16w, after practically continuous coring, located the salt water contact in the Massive sand at —8,617 ft., giving a total Massive section of 411 ft., with alternating shales and oil saturated sections. Coring has continued to a total depth of 9,080 ft., into the Lower Cretaceous, with only one show of heavy oil at 9,020-26 ft. Preparations are being made for a completion, which may be a dual one, taking gas and distillate from upper pay zones and heavy oil from the Massive sand pay.

MISSISSIPPI WILDCAT COMPLETION

Tate County: E. R. Owen et al 1 Davis unit, approx. NW SW 11-4s-7w, dry, TD 3,018 ft., Eutaw 2,776 ft., Paleozoic 3,000 ft.

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KANSAS

Two Extensions and a New Pool Pay Off This Week

BOTH the Silica pool of Rice County and the Albert pool of Rush and Barton counties have been extended this week by Nadel and Gussman. Nadel and Gussman A-2 Bayer, NE SW SW 29-19s-10w, extended the Silica pool to the north with a sizable oil well. Casing was cemented at the Arbuckle top of 3,275 ft., and when the plug was drilled, the hole filled up with 3,000 ft. of oil in 1 hour. On a pumping test, the well made 60 bbl. per hour for 10 hours.

Nadel and Gussman 1 Hass, SE SW SW 30-18s-15w, Barton County, extended the Albert pool to the south. Basal sand was topped at 3,535 ft. and the well was drilled to 3,568 ft. The well is flowing 20 bbl. per hour without treatment and making an estimated several million feet of gas.

Cities Service Oil Co. 1 Jenkins "B," SW SW SE 4-25s-12w, 3 miles northeast of Leesburgh pool in Stafford County, is making an oil well. After acidization at 3,713-25 ft., it swabbed 27 bbl. oil and 105 bbl. water in 20 hours. Operators will continue testing. Lansing was topped at 3,534 ft., Kinderhook 3,883 ft., Simpson 4,016 ft., and Arbuckle at 4,140 ft.

McPherson County may have another oil well in Williams & Morine 1 Henne, SW SW SW 4-17s-1w, 2 miles north of Henne pool. At 2,645 ft., the hole filled with 1,200 ft. oil, and bailed 5 bbl. in 30 minutes. The well will be put on the pump. Mississippi lime was topped at 2,618 ft.

H. E. Alexander et al 1 Schmeidler, NW NW SE 28-12s-17w, south of Bemis-Shutts pool in Ellis County, is setting pipe. The Arbuckle was cut at 3,626 ft. with good porosity and saturation.

Operations continue normally with 40 new locations, including 16 new wildcats. Cowley County takes the lead with five new wildcats, and Ellis County has two. One apiece are scheduled for Barton, Finney, Greenwood, McPherson, Ness, Rice, Saline and Stafford.

KANSAS WILDCAT COMPLETIONS

Sedgwick County: Beech Aircraft et al 1 Doyle, NW NW NE 5-28s-2e, dry, TD 3,454 ft., Arbuckle 3,445 ft.

Trego County: Eldorado Refining 1 Benson, NW NW SW 21-12s-22w, dry, TD 4,127 ft., Arbuckle 4,108 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo.—Magnolia Petroleum Co. 1 C. S. Imus, 5 miles southwest of the McLouth field in Kansas, and in SE NE SW 15-10s-19e, Jefferson County, Kansas,

had top of Hunton lime at 1,992 ft., a showing of oil at 1,985-89 ft., pulled a core at 2,003-10 ft. and recovered 7 ft. of saturated lime with poor porosity. The test was drilling ahead.

Clifton Gall of Falls City, Neb., was waiting for drilling-in tools to test Hunton lime at 1 Livengood in NE NW SW 9-1s-15e, Brown County, Kansas, 5 miles southwest of the Falls City field. Elevation is 1,075 ft. and in a core from 2,570 to 2,590 ft. there were 8 ft. of fair porosity and saturation. The Hunton top is at 2,568 ft.

MISSOURI WILDCAT COMPLETIONS

Jackson County: Rafner Electric Works 1 fee, NE NE NE 4-49n-33w, dry, TD 820 ft., Burgess 815 ft.

ILLINOIS

Wildcat in Franklin County Makes Good Showing

CENTRALIA.—Thirty-two oil wells and 12 dry holes were reported completed in the past week in Illinois fields. The largest initial production reported was from Superior Oil Co. 4 Price, NE SE SW 19-1s-2e, Jefferson County, which started off at 453 bbl. per day from Aux Vases sand at 2,134-56 ft., total depth 2,158 ft. British American Oil Co. 3-A Lissner, NW SW SE 19-1s-2e, was good for 148 bbl. initially from Benoist sand at 2,041-46 ft. and 2-A Lissner, SE SW SE Section 19, started at 240 bbl. from Benoist sand at 2,053-56 ft. Rock Island Refining Co. 2 Chalcraft, SW SE NW 12-3s-10e. Albion Consolidated field in Edwards County produced 300 bbl. in 24 hours from Biehl sand at 1,959-65 ft.

Deep Rock Oil Co. 1 J. M. Kirk, trustee, a wildcat in NE SE SE 15-7s-4e, Franklin County, on a drill-stem test of Aux Vases sand, recovered 850 ft. of clean oil, 120 ft. of oil-cut mud and 60 ft. of drilling fluid and fresh water. Total depth was 3,149 ft.

The State Geological Survey in Illinois reports that in October three pools were extended and five new producing sands in pools were opened. The extensions are of Storms in White County, Iola in Clay County, and Lawrence, in Lawrence County. The new producing sands are reported as the Cypress sandstone in the Benton North pool, Franklin County, McClosky limestone in the Calhoun pool, Richland County, Levias limestone in the Mount Carmel pool, Wabash County. Aux Vases sand in the Boyd pool at Jefferson County, and Levias lime in the Divide West pool of Jefferson County.

Forty-five new operations were reported during the week including 13 wildcats in 12 counties as follows: Aetna 1 French, SW SE SE 15-1n-9e, and Pure Oil 1 F. M. White, SW NW SE 6-1n-9e, Wayne County; Q. B. Mitchell 1 Henderson, SW SW NW 5-2s-14w, Edwards County; Homer Luttrell et al 1 Stousisi, NW NW NE 25-6n-5e, Effingham County; Continental 1 Frank L. Simmons, NE NE SE 22-1n-4e, Marion County; W. I. Lewis, 1 Conrad Schul, SE SE NW 9-3s-3e, Jefferson County; Ollie Baugher 1-A Edwards, NW SE NE 26-12n-5e, Shelby County; W. H. Wright 1 W. Doran, NW NW NW 29-9n-13w, Clark County; Pure Oil 1 Theodore Dhom-A, SW SW SE 34-7n-10e, Jasper County; Adkins 1 Old Ben Coal, SW SE SW 15-7s-3e, Franklin County; Texas Co. 1 F. M. Miller, NW NW NW 22-6n-2w, Bond County; Joe May 1 Carlyle Community Park, trustees, 31-2n-2w, Clinton County. Sinclair Wyoming Oil Co. 1 Clyde Russell, SW SE SW 17-7s-5e, Hamilton County.

ILLINOIS WILDCAT COMPLETIONS

Clinton County: R. L. Rea 1 Jansen, SW NE NE 32-2n-2w, dry at 1,261 ft. No log.

Gallatin County: Continental and Gulf 1 Art Maloney, NE NE NW 35-8s-9e, 5 bbl. of oil and 1 bbl. of water at 2,456-80 ft. No log. Abandoned as a dry hole.

Hamilton County: Phillips Petroleum 1 Wilma, SE SW NW 7-4s-7e, dry at 3,512 ft., Menard 2,460 ft., Bethel 3,214 ft., Ste. Genevieve 3,320 ft., McClosky 3,432 ft.

Reward Oil 1 C. C. Walker, SE NW NW C 13-6s-7e, dry at 3,490 ft., Glen Dean 2,717 ft., Cypress 3,023 ft., Benoist 3,190 ft., Aux Vases 3,304 ft., Fredonia 3,424 ft.

Madison County: Fox & Fox 1 Cassens, NE NW NE 14-5n-7w, dry at 2,366 ft., Ste. Genevieve 765 ft., Devonian 1,675 ft., Maquoketa 2,104 ft., Trenton 2,282 ft.

St. Clair County: C. W. Young 5 McCurdy, SW NW SW 29-3s-6w, dry at 545 ft.

Shelby County: Homer Luttrell 1 McAndrew, C SW NE 15-10n-6e, dry at 2,319 ft., Glen Dean 1,844 ft., Cypress 1,977 ft., Benoist 2,079 ft., Aux Vases 2,152 ft., McClosky 2,230 ft., St. Louis 2,298 ft.

Wabash County: A. H. Anderson et al 1 C & P Crouch, SW NW SE 2-1n-13w, dry at 2,691 ft., McClosky lime at 2,636-41, 2,653-57 ft., small show of oil.

LA.-ARK.

Big Gas Area Indicated For De Soto Parish

SHREVEPORT.—A large gas area in De Soto Parish is indicated by the recompletion of an abandoned well 1½ miles northwest of Phillips and Schoonmaker 1 Anthony, SE NE 9-11n-14w, as a very large gas well. The recompletion is the former Crosby Drilling Co. 17 Anders, SW NE 4-11n-14w, abandoned early last year, after drilling to 6,327 ft., and testing at 4,960-70 ft., about 100 ft. below the recompleted pay zone. Taken over by Phillips et al, the well was cleaned out, perforated with 23 shots at 4,868-76 ft., acidized with 5,000 gal., and blew in with gas volume estimated at 40,000,000 cu. ft.

ARKANSAS WILDCAT COMPLETION

Ouachita County: Skelly 1 Pate, SE SW NE 9-14s-17w, dry, TD 4,351 ft., Smackover 4,290 ft.

NORTH LOUISIANA WILDCAT COMPLETION

Grant Parish: Claud Morgan 1 Wettermark, 1,980 ft. south and 660 ft. west NE cor. 24-5n-3w, dry, TD 7,001 ft.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended November 4, 1944					Cumulative total, 1944				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	0	0	0	0	0	2	0	17	59	78
Indiana	0	0	0	0	0	4	0	0	20	24
Illinois	0	0	0	8	8	29	0	0	274	303
Kentucky	1	0	0	0	1	14	0	0	73	87
Michigan	0	0	0	10	10	12	0	3	211	226
Kansas	0	0	0	2	2	46	0	9	370	425
Neb., Mo., Iowa	0	0	0	1	1	1	0	0	15	16
Oklahoma	2	0	0	9	11	62	1	20	235	318
Texas:										
North Central	1	0	0	7	8	56	0	1	262	319
West	0	0	0	0	0	39	0	3	153	195
Panhandle	0	0	0	0	0	0	0	2	9	11
Eastern	0	0	0	6	6	5	0	4	108	117
Gulf Coast	0	0	0	6	6	30	12	13	196	251
Southwest	0	0	0	5	5	21	4	15	206	246
Total Texas	1	0	0	27	28	151	16	38	937	1,142
Louisiana:										
Northern	0	0	0	1	1	5	0	2	51	58
Southern	0	0	0	0	0	8	6	0	40	54
Total Louisiana	0	0	0	1	1	13	6	2	91	112
Arkansas	0	0	0	1	1	2	1	0	51	54
Mississippi	0	0	0	1	1	3	0	0	57	60
Ala., Ga., Florida	0	0	0	0	0	2	0	0	27	29
Montana	0	0	0	2	2	3	0	4	42	49
Wyoming	0	0	0	0	0	16	0	2	18	36
Colorado-Utah	0	0	0	0	0	3	0	1	25	29
New Mexico	0	0	0	0	0	6	0	3	48	57
California	0	0	0	4	4	6	0	8	161	175
Total United States	4	0	0	66	70	375	24	107	2,714	3,220
Total previous week	11	0	4	61	76					

OHIO, KENTUCKY

Sandyville Field Adds Two Above-Average Wells

COLUMBUS.—Both the north and south ends of the Sandyville field had a better than average completion this week.

Hanley & Bird 1 Orda Wetman, Section 6, Fairfield Township, Tuscarawas County, gaged 2,979,000 cu. ft. natural from the white Clinton at 4,843-69 ft. Frank Lyons 1 Helen Mikinda, Section 4, Pike Township, Stark County, gaged 554,000 cu. ft. in the Red Clinton at 4,680-4,711 ft., and 1,444,000 cu. ft. in the white Clinton at 4,711-41 ft. The well was shot and shut in at 2,250,000 cu. ft.

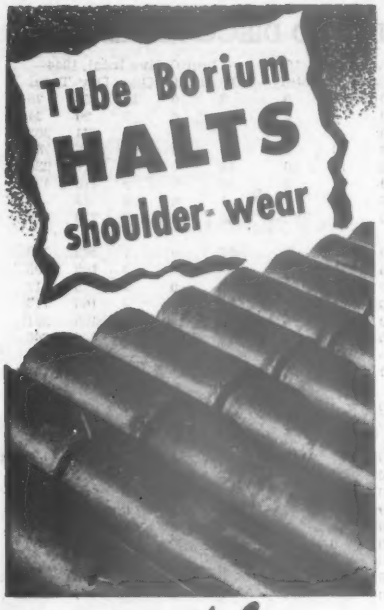
Hanley & Bird extended the La Grange pool in Lorain County a location to the southwest by a 3,360,000 cu. ft. gas well on L. C. Dernier tract, Lot 83. Pay was at 2,365-70 ft. and at 2,372-74 ft.

The Symmes Township, Lawrence County, pool was extended a location to the west by Ohio Fuel Gas Co. 1 Irish & Riley, Section 19. Sand at 3,135-50 ft. gaged 489,000 cu. ft. natural.

WESTERN KENTUCKY

OWENSBORO, Ky. — The 13 wells reported as completions in western Kentucky in the past week include 6 oil wells, one of which opened a pool in Webster County that looks to be of im-

(Continued on page 142)



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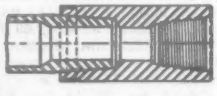
APPLICATION: Accepted method of application is to under-cut new or resleeved joints at the shoulder to form a recess ⅛" deep by 1½" wide. The recess is then filled by welding in with ¾" Electric Tube Borium to form the wear resistant inlay.



Write for this special Stoody engineering bulletin describing in detail hard-facing procedures on tool joints—no obligation.

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Among the Drilling Contractors

Drilling & Exploration Co., Los Angeles, running 10 strings of drilling tools in California, has a full drilling program for another several months with drilling contract jobs already signed up. The company's latest job will be an exploratory hole in Venezuela. This company may do some drilling for Union Oil Co., after geological work in Paraguay.

Rocky Mountain Drilling Co., Los Angeles, will drill Amerada Petroleum Corp's new wildcat near Brawley in the Salton Sea district of Imperial County, California. An early spud will be made.

Atlantic Oil Co., acting as drilling contractor, will drill an outpost in the Harbor City district of Los Angeles basin for John Shumacher in 31-4s-13w.

Helmerich & Payne, Inc., drilling the O. G. Harp 1 Mattheson, in NE NW NE 19-10n-2w, Cleveland County, Oklahoma, was rigging up heavier drilling equipment at total depth of 5,237 ft. Same contractor has contract on The Texas Co. 1 Pierce, in SE SE NE 32-29n-8w, Grant County, Oklahoma, which was drilling below 1,000 ft.

B & T Drilling Co., Falls City, Neb., is drilling contractor on the L. M. Bates 1 Fritz, in SE SE SE 34-3s-15e, a wildcat test 1½ miles north of Verdon, Richardson County, Nebraska. Rotary rig is being used.

Summit Drilling Co., Tulsa, is the contractor on the Midco Oil Corp. and Mid-Continent Petroleum Corp. 1 Robertson, a wildcat Wilcox sand test in NW SE NE 30-24n-1w, 6 miles east of Billings, in Noble County, Oklahoma.

Big West Drilling Co., Dallas, contractor on the M. H. Marr et al 1 Barnett, in C SW SW 3-25n-11e, Stoddard County, Missouri, in the Boot Heel district, was drilling below 500 ft.

Newell & Chandler of Calgary, Alta., have purchased building lots and trucking equipment at Taber for use in connection with their drilling contracts in the Taber field, southern Alberta.

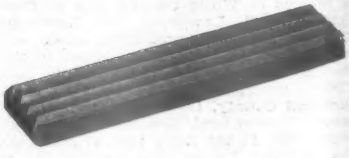
Hinkle Oil Co. has the drilling contract on the Maguire Industries, Inc., 1 Harnett, in NE NE NE 34-23-11w, Stafford County, Kansas.

Mercury Drilling Co. has set surface pipe at 325 ft. on The Texas Co. 2 Dumler "B" in E½ SE SE 1-14s-15w, Russell County, Kansas.

Apex Drilling Co. will drill to 1,500 ft. a wildcat Superior Oil Co. of California has spudded in Blaine County, Oklahoma, after which Superior will move in a heavy unit to go to the Wilcox sand. The test is the 1 Norris, in NE NE NE 17-19n-10w, in the Anadarko basin.

Harry W. Smith, drilling contractor, of Petrolia, Ont., recently spud-

WEB WILSON
Tong Dies



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SEE COMPOSITE CATALOG
PAGES 3101 TO 3120

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RECTORSEAL
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ded a test for Nova Scotia Oil & Gas Co. at Kennetcook, in Hants County, Nova Scotia. Smith recently returned to Canada from drilling in Trinidad.

Split-Day Pay Plan Invalidated by Court

WASHINGTON. — The so-called "split-day pay plan contract" was invalidated this week by a unanimous ruling by the Supreme Court.

The plan was used by Helmerich & Payne, Inc., Tulsa, producer of oil and gas, but was abandoned after the wage-hour administrator began court action against it.

Solicitor General Charles Fahy said the firm under the plan paid certain employes a regular wage for each 8-hour shift, called a tour, regardless of the number of hours worked in a week.

"In order to avoid paying higher rates for overtime under the act," Fahy said, the firm caused employes to sign agreements reciting that it would pay them a stated regular rate per hour for the first 4 hours of each 8-hour tour, and one and one-half times that rate for the next 4 hours.

The "regular rate" was worked out according to a formula which Fahy said was "designed to insure that the total tour wage would continue to be the same as before" adoption of the plan. The Government contended the "regular rate" under provisions of the act should be determined by dividing the total number of work hours into the weekly salary.

The court's opinion held that the act "limits to 40 a week the number of hours that an employer may employ any of his employes, unless the employe receives compensation for his employment in excess of 40 hours at a rate 'not less than one and one-half times the regular rate at which he is employed.' The split-day plan here in issue satisfies neither the purpose nor the mechanics of this requirement."

California Oil Safety Engineers Redraft Rules

LOS ANGELES.—Seventy-five oil and gas industry safety engineers assembled here November 2 finished their discussions of the state Industrial Accident Commission's new safety proposals. The engineers analyzed the 40-page set of proposals and suggested revisions where necessary to make them workable in terms of the complicated equipment in refineries and processing plants.

The meeting was sponsored by California Oil & Gas Association. Don Gilman, executive vice president of the association, presided.

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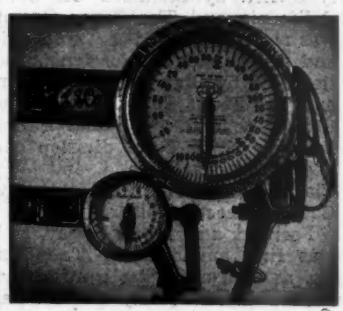

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PERSONALS

Farrand Director of Production for New Company

WILLIAM H. FARRAND, superintendent of drilling and production in the Pacific Coast division of The Texas Co., on November 16 will join American Overseas Petroleum Co. as director and vice president in charge of production, with headquarters in San Francisco. American Overseas Petroleum Co. is jointly owned by Standard Oil Co. of California and The Texas Co. and was recently formed for exploration and development of foreign properties held by Standard of California and The Texas Co. with the exception of their Arabian and Bahrein interests. J. H. Puls, division engineer, succeeds Farrand, and W. A. Clark, district engineer at Fellows, Calif., succeeds Puls.

Farrand, a native of Holley, N. Y., was first employed by The Texas Co. as assistant petroleum engineer at Santa Fe Springs in 1929 and later at Signal Hill. In 1913, he became superintendent of the Ventura district producing operations, and in 1938 he was appointed to the post he is now vacating. His previous foreign experience from 1923 to 1927 was with Romano-Americana, a Romanian subsidiary of Standard Oil Co. (New Jersey).

Farrand is chairman of the A.P.I. topical committee on drilling practice, California district; member of the A.P.I. central committee on drilling and production practices, California district, and chairman of District 18 field committee of Conservation Committee of California Oil Producers.

Reese H. Taylor, president of Union Oil Co. of California, and Miss Margaret Corrie were married in Los Angeles during the past week.

Frank J. Kuckert, supervisor of stocks and materials for Carter Oil Co., Tulsa, has been retired, after a service of 26 years.

Lt. Fred A. Henninger has been appointed manager of the service department of Anchor Petroleum Co., Tulsa. Now on inactive duty, he will devote full time to his new connection.

Max Birkhauser, of Shell Oil Co., Inc., has been transferred from senior geologist in Canada to senior geologist in the Los Angeles office of Shell.

A. E. Brainerd, of the geological department, **H. P. Macaulay** of the land department, and **J. C. Johnston** of the production department of Continental Oil Co., Denver, were in Calgary recently to study oil developments in Alberta.

Howard Pape, formerly manager of the valve and fitting department for Crane Co., Chicago, has been appointed vice president of the W-K-M Co., Inc., Houston, manufacturers of valves and other oil-field equipment. Pape has spent nearly 30 years in the oil industry. He joined Tide Water Associated Oil Co. in 1915 and a year later became associated with Cosden & Co. (now Mid-Continent Petroleum Corp.) and advanced to the position of chief engineer and mechanical superintendent. He had been associated with the Crane Co. since 1936 in charge of oil-industry valve distribution.

Elmer J. Weis, vice president of Pacific Pumps, Inc., at Huntington Park, Calif., is flying halfway around the world on a "service call" which will help speed the flow of oil to the Allied war machine. Encountering some unique pumping problems, the Anglo-Iranian Oil Co. sent an S.O.S. for a Pacific Pump specialist to help solve the problem. Weis was selected and left immediately for Abadan, Iran.

Francis S. McIlhenny, Jr., Philadelphia, has been appointed assistant secretary and assistant treasurer of Sun Oil Co., reporting to **Frank Cross,** secretary and treasurer of the company.

Harold F. Sheets, chairman of Socony-Vacuum Oil Co., Inc., has been appointed a member of the petroleum industry's foreign operations committee by Ralph K. Davies, deputy petroleum administrator.

Maj. Sparling B. Anderson, president of the Royden Drilling Co., a contracting firm in Texas and Oklahoma, is commanding officer of the Marine barracks at the naval air station at Elizabeth City, N. C.

H. D. Carter has resigned as president of the South Shore Oil & Development Co., and **E. W. Neason** has resigned as secretary-treasurer of the same company. Carter will devote his entire time in the future to Oil Trading Co., New York. **Andrew Milek,** vice president in charge of operations for South Shore Oil & Development Co., becomes the chief executive officer and will remain at the company's Houma, La., offices.

Roland Jarrett, Midland, Tex., oil operator, has been promoted from warrant officer in the U. S. Army Air Forces administrative section to chief warrant officer. He is stationed at a base in India.

J. Howard Pew, president of the Sun Oil Co., last week presented the text and visual educational material of the Yale University Press American history program to the schools and educational organizations of Delaware County in a ceremony at the Teachers Institute, Media, Pa.

F. A. C. Guepin, senior vice president east of the Rockies for Shell Oil Co., Inc., is leaving to assume a position with the Shell organization in London. **C. P. Bristol** has

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been appointed division manager of the East Texas production division of the Texas-Gulf area for Shell. Bristol has been district superintendent at Hobbs, N. M., and Kilgore, Tex. **A. C. Hogge, Jr.,** has been named chemist in charge of the Wood River experimental laboratory. He joined Shell in 1936 and most recently held the position of technologist in the development section of manufacturing at the head office.

Walter T. Price, Jr., has joined Shamrock Oil & Gas Corp. as office manager of the production department. **Eli Monsour** was recently added to the Shamrock geological department, and is now stationed in Jackson, Miss.

J. B. Harkness has joined the Shell Oil Co., Inc.'s Houston refinery as control laboratory chief chemist. He replaced **E. B. Ayers,** who resigned on September 1. Harkness was formerly with the Wood River plant.

Paul A. Dielman, Toledo, has been appointed office manager of Sun Oil Co.'s Michigan production division.

William W. Weston, formerly oil editor of the New York Journal of Commerce, and on the editorial staff of the National Petroleum News, has become assistant director of public relations for Sun Oil Co.

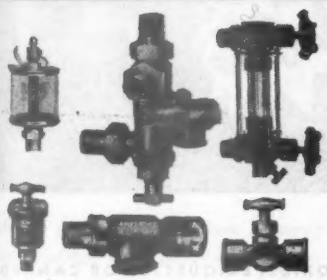
Raymond F. Leggett has taken the position of West Texas scout for Continental Oil Co. He suceeds **Jim Jackson,** who has gone to Levelland to work with the Western Co.

A. W. McCoy III, has accepted a position as geologist with Deep Rock Oil Corp. at Tulsa. He was formerly with Carter Oil Co. at Billings, Mont. **A. B. McCollum,** formerly geophysical supervisor for Superior Oil Co., of California, at Oklahoma City, has also accepted a position with Deep Rock, and will take charge of geophysical work.

James Peter Sheffield, and **James Daniel Tyree,** both of the Baytown refinery of Humble Oil & Refining Co., are retiring at the age of 65. Sheffield started his career with Humble in September of 1919, in the Goose Creek oil field. Tyree has been with Humble since November 1921, in the pipe department.

Bettye Bohanon, formerly petroleum production and price analyst with the Petroleum Administration for War, has been appointed assistant to the petroleum attache at the U.S. Embassy at Lima, Peru, the first woman to be appointed to such a post. She served as executive secretary of the California Conservation Committee from 1930 to 1941.

PENBERTHY
QUALITY
PRODUCTS



Penberthy liquid level gages of various types—injectors—ejectors—lubricating devices all so widely used throughout the oil industry because they have always been dependable under the most severe service conditions.

All are of rugged construction and made by an organization with 57 years experience in the manufacture of quality products.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Save Metals . . . Speed Wire Rope Work . . With a
FIST-GRIP

The "Fist-Grip" Clip Has 3 Strikes on Hitler

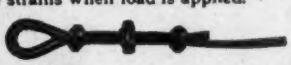
Saves accidents — can't be put on wrong; doesn't weaken rope; greater holding power.

Saves metals—25% fewer clips do the job better; no crushed rope ends; flush nuts—no battered threads.

Save time—fewer clips to put on; nuts on opposite sides tighten easier, faster with any type wrench.

Greater holding power with 25% less clips!

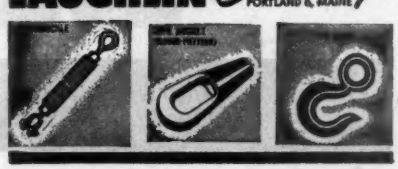
"Finger-Pinch". U-bolt clips unavoidably crimp, distort and bow wire rope, causing reverse strains when load is applied.

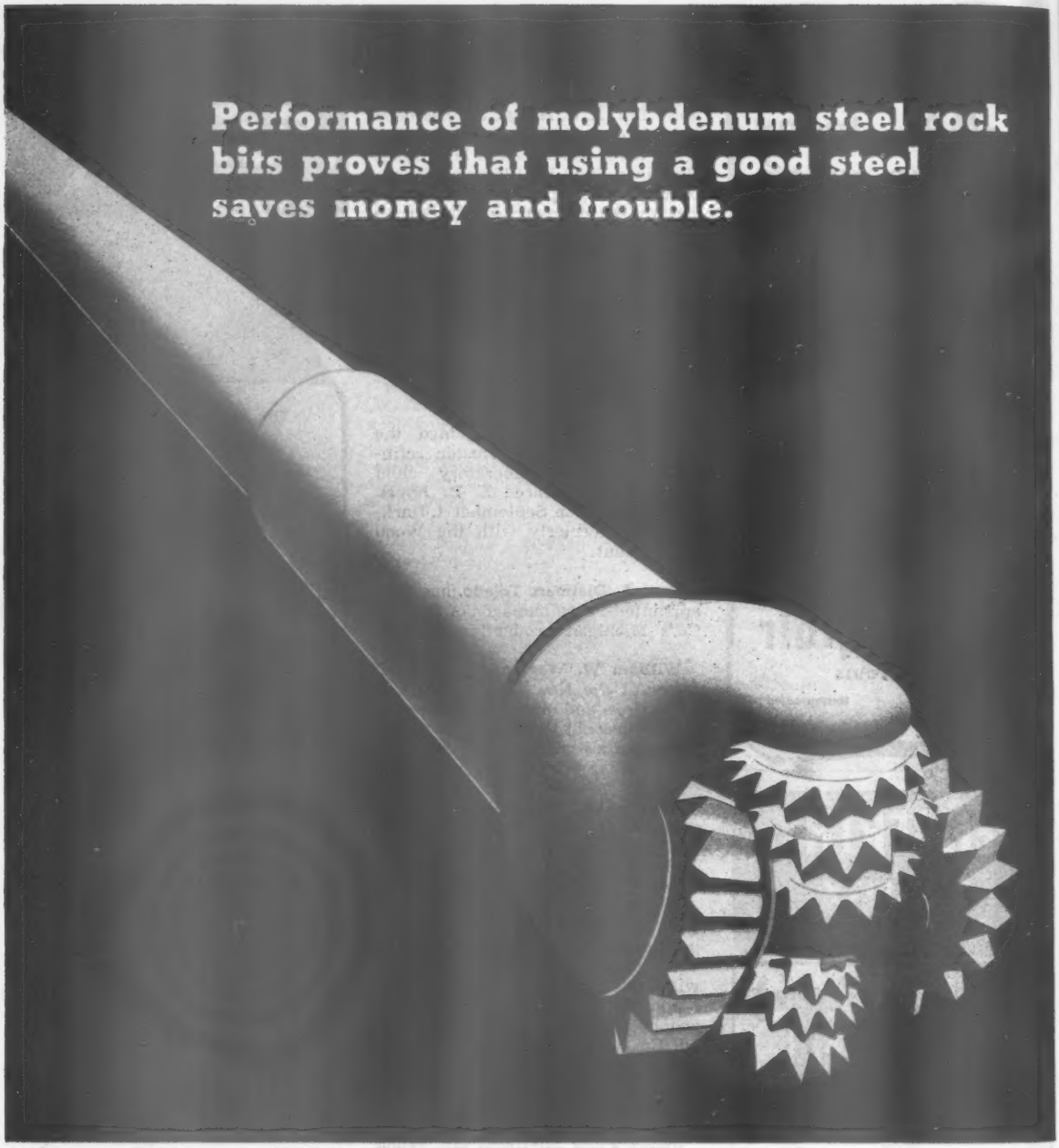


"Fist-Grip". Fewer Safety Clips hold rope straight in smooth, vise-like grip, with no protruding threads to get battered in use. Clips and rope can always be used on the next job.

Distributed through
Mill, Mine, and Oil Field Supply Houses
Look for Laughlin products in the Composite Catalog
FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE





CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

Industrial Items

Allis-Chalmers Announces New Products

An expanded line of distribution transformers designed to withstand complete submersion in water is announced by Allis-Chalmers Manufacturing Co.

Built for use in underground vaults and similar locations, the subway distribution transformers operate under these conditions without damage to themselves or interruption to service. They are available in standard sizes—10 to 200 kva.—and standard voltages. Specifications include standard NEMA accessories and construction.

Also announced by Allis-Chalmers is a new line of single-stage, double-suction fire and booster pumps designed for efficient, low-cost fire protection. The pumps are approved for heads ranging from 60 to 108 lb. per sq. in. at capacities ranging from 500 to 1,500 g.p.m.

The pump units, approved by Underwriters Laboratories, include pump with brass plugs, umbrella cock, increasers and capacity plate mounted on base plate, and direct-connected to a driver by means of a flexible coupling. According to plant requirements, the units also can be completed with a splash partition plate.

Furfural Supply Easier

Furfural, widely used in solvent refining of lubricating oils, has been removed from the critical list of war materials.

Furfural has been under allocation according to General Preference Order M-224 dated October 1, 1942. Due to its many important wartime uses, not only in the furfural refining process, but also in the extraction of butadiene for the synthetic-rubber program, War Production Board has carried it in Group I. This includes critical materials, the supply of which is insufficient to fill existing military and essential industrial requirements.

Recent action of WPB indicates that the availability of furfural has improved substantially, and accordingly has been placed in Group 2, denoting that the supply is "sufficient for current military and essential industrial needs."

All civilian requirements, in addition to military and lend-lease orders, have been filled in September and October. Though still under allocation, the prospects are reported to be good for continuing to fill all essential needs.

Evans Appointed Tulsa Manager For Empire Company

Art Evans has been appointed sales manager of the Tulsa district for Empire Oil Field Machinery Co., Odessa, Tex., with offices at 706 McBirney Building. Evans came to Tulsa in 1928 and for the past 22 years has been engaged in sales work for National Supply Co.

Allegheny Ludlum Appoints Four to Executive Positions

Allegheny Ludlum Steel Corp. has announced that Dr. Gurdon M. Butler, research metallurgist at the company's Dunkirk plant since 1937, has been made associate director of research of the company's tool and die steel division. Dr. Gunther Mohling, who has been conducting research at the Watervliet plant of the company, becomes associate director of research, high-temperature alloy and valve steel division. Dr. R. A. Lincoln, connected with the company's research laboratory at Brackenridge, will now be associate director of research of the stainless steel division; and George C. Kiefer, with the company's Brackenridge plant since 1916, is associate director of research for the corrosion and castings division.

Friden Opens Enlarged Offices in New York

Friden Calculating Machine Co., Inc., of San Leandro, Calif., has opened enlarged New York offices in the newly acquired Friden Building at 336 Madison Avenue. The new offices house both the New York City and eastern sales and service divisions as well as a service training school. J. Arthur Russell is New York City agency manager, and Larry Taylor, eastern division manager.

Jessop Adds Improved Cutting Metal to Line

Jessop Steel Co., Washington, Pa., announces the addition of an improved cutting metal to their line of cutting tools. The new tool is a cast nonferrous alloy made up principally of chromium, tungsten and cobalt. Its hardness range is from 60 to 62 Rockwell C. This type of material bridges the gap between high-speed and cemented carbide cutting tools.

The new tool is cast-to-shape and is used in the as-cast condition, that is, other than being surface ground. Exceptionally high red hardness is shown by the tool inasmuch as only one point drop in Rockwell C is noted at temperatures ranging as high as 1,900° F. This alloy cannot be hot worked and it is not susceptible to heat treatment.

Giles Will Head Sales

Atlas Lumnite Cement Co., United States Steel Corp. subsidiary, announces the appointment of Roy T. Giles, service director, as sales manager.

Will Represent Three Companies

Roy E. Busch, who has been representing Scovill Manufacturing Corp. in the Southwest for the past 5 years, and L. Keith Baldwin, who has been connected with Industrial Insulators of Houston, announce the formation of Busch-Baldwin Co. This company will represent Scovill Manufacturing Corp., Nurnberg Thermometer Co. and Emil Greiner equipment.

Pennington Joins Graver

Ben D. Pennington is now associated with Graver Tank & Manufacturing Co., Inc., as manager of the Los Angeles office at 906 South Atlantic Boulevard. His major interests will be directed toward the construction field.

Swartz Leaves Bowser

Ben H. Swartz, who has represented S. F. Bowser & Co., Inc., as district sales manager at San Francisco and Los Angeles for almost 11 years, has resigned.

Sperry-Sun Appoints Rocky Mountain Representative

Sperry-Sun Well Surveying Co. announces the appointment of Inland Oilfield Service, Inc., as exclusive representative in the Rocky Mountain territory, including the states of North Dakota, South Dakota, Montana, Wyoming, Utah and Colorado. The main office of the Inland is in Casper, Wyo. Glenn N. English is president of the organization. English was formerly with Manning & Brown, Inc., drilling contractors, as superintendent.

Opens Tulsa Sales Office

P. K. Nelson, owner of Nelson Automatic Gauge Co., announces opening of a sales office at 402 Oklahoma Natural Gas Building, Tulsa. This firm manufactures remote indicating, electric liquid level gages. Safety features for the oil industry are incorporated in the equipment and readings can be transmitted over wires for long distances.

Decals for Fire Extinguishers

A set of three decalcomanias for first-aid fire extinguishers has been made up by Walter Kidde & Co., Inc., manufacturers of fire-protection equipment. These decals, which can be transferred to the extinguisher itself or to the wall behind its station, indicate briefly and clearly the fires for which that particular unit is suitable, and those on which it should not be used.

Schlumberger Executive Returns

J. L. Mathieu, vice president of Schlumberger Well Surveying Corp., has returned from a 6-week business trip to Venezuela and Trinidad.

Houdry Names Danner and Cragin Vice Presidents

Arthur V. Danner has been appointed as executive vice president, and Robert B. Cragin as vice president in charge of sales engineering and a technical advisor of Houdry Process Corp. Both have been elected members of the board of directors and Danner has been made a member of the executive committee of the board.

Danner was 7 years with Socony-Vacuum Oil Co., Inc., where he served as patent attorney. Prior to joining Socony-Vacuum he had experience in the chemical industry and as examiner in the U. S. Patent Office.

Cragin comes to Houdry from M. W. Kellogg Co., where he served as director of petroleum research and later as sales engineer.

Ives New Chief Engineer Of Kieley & Mueller

Kieley & Mueller, Inc., North Bergen, N. J., announce the appointment of Clifford B. Ives as chief engineer. He has been associated with control problems for the past 15 years.

Lane-Wells House Organ Cited in Contest

For outstanding excellence and achievement and value to the war effort, the house organ of Lane-Wells Co., Tomorrow's Tools—Today!, was honored recently and selected a winner in the "Leaders of 1944" contest at the convention of the Direct Mail Advertising Association.

Pipe Line Construction Active in California

Pipe laying during the last half of this year in California has been unusually active. In recent months the $4,000,000 project for Southern California Gas Co. and Southern Counties Gas Co., both subsidiaries of Pacific Lighting Corp., has been under construction for the laying of nearly 100 miles of 16-in. and 18-in. pipe to serve the Goleta underground storage reservoir. In planning for this work consideration was given to the requirements for handling gas which might be transmitted from the Hugoton field of Kansas, Oklahoma, and Texas, for which application has recently been made to federal authorities by Pacific Gas & Electric and Pacific Lighting Corp.

In the building of lines to provide additional crude-oil outlets for the Elk Hills field, California, work is reported to be progressing steadily. The line to replace the 8-in. line leased by General Petroleum Corp. of California to Rubber Reserve Corp. has been completed for General Petroleum. Work has started on an 8-in. line for the company to serve the Torrance refinery. Pipe is being laid for the 10-mile 6-in. line of General Petroleum from Castaic Junction to Fremont Junction.

For Union Oil Co. of California most of the pipe has been laid for a 9-mile 8-in. line. Completion is expected this month. In preparation for operation, boilers and pumps have been tested.

The Texas Co. is building a 61-mile 10-in. line. Construction of pump station has started. Dismantled tanks are being reerected at Cottonwood.

Kentucky Fields

(Continued from page 135)

portance as the initial production of the discovery well was 318 bbl. Ross Bartmes et al 1 Leora Wilson, in 17-N-23, 2 miles south of the town of Poole, found Tar Springs sand at 1,908-20 ft., the total depth, which was given a 20-qt. shot. About 15 bbl. of water came with the 318-bbl. oil output. Sinclair Prairie 1 H. C. Bridwell, an offset to the Ross Bartmes well, produced 125 bbl. initially from Tar Springs at 1,908-27 ft.

In Union County, 2 miles south of Sturgis, and 12 miles from other production, Waller Chenault, H. C. Farmer and Basin Drilling Co. 1 Slayton, tested Hardinsburg sand at 1,347-54 ft. and recovered 60 ft. of oil, 180 ft. of oil-cut mud and no water. Carl Robinson and Aetna Oil Co. own offset leases.

WESTERN KENTUCKY WILDCAT

Webster County: Ross Bartmes et al 1 Leora Wilson, 17-N-23, Tar Springs 1,908-20 ft., shot with 20 qt. 318 bbl. of oil, 15 bbl. of water in first 24 hours. A discovery well.

EASTERN KENTUCKY

ASHLAND. — One oil well was completed in Eastern Kentucky this week.

Ashland Oil & Refining Co. completed 6 J. W. Gillum in Elliott County with a daily oil production estimated at 5 bbl.

North Central Texas

(Continued from page 130)

2½ mi. N and 1¼ mi. W Lindsay, elev. 893 ft., Ellenburger 2,549 ft., dry, TD 2,759 ft.

Jack County: Hanlon-Buchanan 1 C. E. Matlock, A. H. Latimer Sur., A-363, 3 mi. S and 4 mi. W Jacksboro, elev. 1,228 ft., Caddo 4,434 ft., Mississippian 5,311 ft., flowed 567 bbl. a day, TD 5,344 ft.

Throckmorton County: Shell Oil Co., Inc. 1 Hill Allen, Sec. 288, BBB&C Sur., A-906, 1½ mi. N Throckmorton, elev. 1,115 ft., Chappel 5,020 ft., Ellenburger 5,230 ft., dry, TD 5,470 ft.

Young County: Rathke Oil Co. 2-B C. W. Johnson, H. F. Young Sur., A-1286, 1 mi. S and 2 mi. E Graham, elev. 1,125 ft., Barnett 4,568-4,650 ft., Mississippian 4,650 ft., Ellenburger 4,775 ft., dry, TD 4,900 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Jones County: Eason Oil Co. and Jones & Stasney 3 J. D. Freeman, H. Virn Sur. No. 263, 2 mi. W Truby, elev. 1,764 ft., Hope 2,725-30 ft., Swastika 2,830-45 ft., dry, TD 2,849 ft.

Oklahoma

(Continued from page 129)

clair Prairie Oil Co. announced a location in 1-14n-9w, Canadian County, about 10 miles northwest of El Reno. Ace Gutowsky, discoverer of the West Edmond field, announced a test in 14-24n-11w, Alfalfa County.

OKLAHOMA WILDCAT COMPLETIONS

Carter County: Continental 1-A Fowler, NW SE SW 31-2s-2w, flowed 365 bbl. of 39.5° gravity oil and 4,290,000 cu. ft. of gas in 4 hours, pay zone Hunton 5,410-30 ft., TD 8,249 ft., PB 5,470 ft., Deese 2,080 ft., middle Oolitic sand 3,340 ft., Woodford 4,914 ft.

Creek County: Curtis Oil 1 Cooper, SE SW 19-18n-11e, dry, TD 1,996 ft., Oswego 1,466 ft.

Garfield County: E. S. Adkins 1 School Land, NW NE NW 36-21n-4w, dry, TD 2,310 ft., Neva 1,910 ft.

Garvin County: Sinclair Prairie 2 Allred, SE NW SE 20-3n-3e, flowed 126 bbl. and 1,800,000 cu. ft. gas from pay zone 1,890-1,908 ft., gravity 29.8°, TD 1,908 ft., first Bromide 1,890 ft.

Grady County: Ohio 1 Hemphill, NE NW SW 18-5n-6w, dry, TD 7,283 ft., Melton 7,188 ft.

Jefferson County: Bridwell 1 Smart, SE SE NW 13-7s-6w, dry, TD 2,233 ft., granite 2,194 ft.

Love County: Sinclair Prairie 1 Donaghey, NW SE NE 35-8s-2e, dry, TD 6,429 ft.

Marshall County: Magnolia 1 Marshall, SW SE SW 4-6s-6e, dry, TD 2,966 ft., Woodford 2,560 ft.

Noble County: Summit Drilling 1 Bartow, SE SE SW 10-20n-1w, dry, TD 5,313 ft., Viola 5,312 ft.

Pawnee County: Kerlyn 1 Barrier, NW NE NW 22-23n-5e, dry, TD 3,674 ft., Wilcox 3,520 ft.

Stephens County: Batson & Mullins 1 Selby, SE SW NW 13-1n-4w, dry, TD 4,003 ft., Jeep 4,002 ft.

West Texas Fields

(Continued from page 129)

when Sun Oil Co. 1 Wheeler, ¼ mile west of production in the south end of the field, made a 1-hour drill-stem test at 8,275-8,527 ft., using 1,000-ft. water cushion. After 1,955 ft. of pipe was pulled it flowed 4,440 ft. of the cushion and oil and gas-cut mud, and recovered an additional 2,200 ft. of oil and mud in the drill pipe. It drilled ahead past 8,550 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Continental Oil Co. 2-B-23 Skaggs, deep wildcat in 23-20-37, Lea County, drilled to 10,465 ft. in solid granite and prepared to run 7-in. casing which will be perforated to test various shows encountered in the Permian section above 8,000 ft. It had topped granite wash at 10,430 ft., going directly from Simpson into the basal section.

In southeastern Lea County, Humble Oil & Refining Co. 1 Federal-Leonard Oil Co. flowed 25 bbl. of oil per hour through ¾-in. choke, with 1,300,000 cu. ft. of gas daily, from casing perforations at 11,890-11,928 ft., after treating the Ellenburger through the perforations with 1,000 gal. of mud acid. It was killed and probably will be reperforated. Production as high as 75 bbl. hourly had been gaged on a drill-stem test before setting casing.

QUEBRACHO EXTRACTS

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